

# Wyoming Department of Agriculture

## Specialty Crop Block Grant Program – Farm Bill

Agreement No. 12-25-B-1498

Final Performance Report

Due: December 29, 2015

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## **SPECIALTY CROP PROGRAM SUPPORT FOR MANAGEMENT, MARKETING, PROMOTION AND EDUCATION**

### **PROJECT SUMMARY**

Previous specialty crop grants supported the program manager's efforts with help for marketing, education on production, processing and consumption. As in past grants the development of specialty crops continued to be a vital goal of the Wyoming Department of Agriculture (WDA). In order to enhance the development of Wyoming specialty crops, the WDA continued to create new opportunities for growers, producers and consumers of Wyoming specialty crops by focusing on marketing, education, research, production, food safety and processing. These efforts continued to be necessary in order to increase the availability and safety of specialty crops within Wyoming and also promote them out of State. Specialty crop funds supported the travel expenses, marketing, support materials and an intern for the Department to cooperate with other state agencies, the University of Wyoming, Community Colleges, producer groups, producers, processors and consumers. The funds also supported site audits to ensure the integrity of the program as well as general and targeted specialty crop marketing at Wyoming grower conferences, educational workshops and trade events to provide information on production, marketing and food safety in order to grow the industry. Without the project our efforts to expand specialty crops in Wyoming would have been greatly reduced.

### **PROJECT APPROACH**

The project supported the travel expenses, marketing, support materials and an intern for Wyoming Department of Ag to cooperate with other state agencies, the University of Wyoming, Community Colleges, producer groups, producers, processors and consumers to expand specialty crop production in Wyoming. The program focused on the following activities.

1. The technical assistance position worked with other agencies and organizations to help develop the specialty crops industry in Wyoming through workshops and conferences.
2. The position continued to do site audits of specialty crop projects.
3. The position continued to support the updating and development of informational brochures, power points website information and other promotional material.
4. The position continued to provide technical assistance to individual growers, processors, producer groups, consumers and educators.
5. The position continued efforts to increase the number of specialty crop grant proposals.
6. The position continued to work on instate and develop out of state specialty crop marketing efforts.
7. An intern was hired to assist with technical assistance and promotion.

8. We continued to monitor past grant activities where possible to see if they continue to have impact on the goals of the program after past funding had ended.

#### **Activities performed**

**The technical assistance position worked with other agencies and organizations to help develop the specialty crops industry in Wyoming through workshops and conferences.**

Program personnel traveled to and supported three horticultural displays at the Wyoming State Fair, provided support at the Wheatland high tunnel workshop, the 4h high tunnel build, the 2014 Famers Marketing Conference and a Preserving the Harvest Seminar. We continue to look for areas that will provide the best benefit for specialty crop production.

**The position continued to do site audits of specialty crop projects as needed.** Audits were completed in Lusk, Cheyenne, Laramie, Saratoga, Lingle, Wheatland, Douglas, Riverton, Casper, Lander, Lagrange, Powell, Cody and Sheridan

**The position supported updating, development and printing of informational brochures, power points website information and other promotional assistance.** A 15x30 high tunnel manual was developed and printed. Brochures for the Producer Season Extension Grants, the Non Profit High Tunnel Grants and the Scholarship Grants were updated, printed and distributed at conferences and workshops. The online specialty crop application manual was updated. Information on the Specialty Crop Program was highlighted in WDA Tuesday Tidbits and Backyard and Barnyards as well as WBC Activities highlighted specialty crop producers and projects. A grant program power point was updated



**The position provided technical assistance to individual growers, processors, producer groups, consumers and educators.** The program provided support to Rocky Mtn. Farmers Union regarding Triple Crown online farmers market, Goshen county Economic Development, Wheatland High Tunnel, Wyoming State Fair, Sheridan Main Street Program, Town of Osage on Community Garden as well as acidified foods and GAP workshops. WDA continued to provide technical assistance to Wyoming Farmers Marketing Association, Coop Extension producers and non-profits on hoop house construction, grant writing and the Department of Education on Farm to School outreach.

**The position continued efforts to increase the number of specialty crop grant proposals.** WDA encouraged researchers to reach out to producers to increase the variety and practicality of applications in the 2013-14 cycles. The data base of 360 economic development professionals, agricultural specialists and producers was updated for marketing the specialty crop program. The number of proposals in 2014 increased to 25 and 10 were funded. Assistance in grant writing was also provided to 4 new to specialty crop producers and 6 nonprofit organizations. A grant seminar was conducted in Casper for producers interested in submitting proposals in 2015.

**The position continued to work on marketing in-state and also develop out of state specialty crop marketing efforts.** Specialty crop program manager facilitated a Wyoming specialty crop grower to be included in the US pavilion at the 2014 Biofac Organic Trade Show in Germany, specialty crop funds promoted three specialty crop companies at Westex in Colorado, provided assistance to certify seed potato growers and helped send a representative to the US Dry Bean Conference.

**We continued to monitor present and past grant activities where possible to see if they are continuing to have impact on the goals of the program after the funding has ended.** Personnel have visited past projects in Lander, Laramie, Torrington, Lusk, Casper, Riverton, Dubois, Dayton, Sheridan, Worland and Douglas to gauge whether they continue to have impact. WDA grant manager also visited three UWYO Research Stations and two community colleges to monitor past and present projects.



The following conferences and workshops were supported:

June 2013 Riverton Acidified Foods Certification (39)

February 2014 Westi Days (Specialty crop booth) (Attendance 120)

February 2014 Fremont County Farm and Ranch (Specialty crop booth) (310)

February 2014 Idea Conference (Specialty crop booth) (210)

March 2014 WY Farmer Marketing Conference (Specialty crop booth and seminars) (135)

March 2014 Laramie Conservation Expo (Specialty crop booth) (640)

March 2014 At Bee University provided support for speaker cost and supplies (140)

April 2014 a poster presentation was displayed at the National Farm to School Conference on our work with schools on hoop houses as outdoor classrooms.

June 2014 Cheyenne Acidified Foods Certification Course (49)

July 2014 WDA presented on “High Tunnels as Outdoor Farm to School Classrooms” at the 2014 National Children and Youth Garden Symposium

August 2014 Wyoming State Fair four displays showcasing specialty crops were open to the public (40,000 plus attendees)

August 2014 Kaycee Boys and Girls hoop house workshop (8) plus 40 in summer program

October of 2014 Lusk School hoop house workshop (82) students and teachers

October 2014 Lander Localfest booth display of specialty crop materials (265)

October 2014 Casper Farm to School Booth display

October 2014 Wheatland Specialty Crop Conference (19) Speaker Support

December 2014 Wyoming Bee Keepers (24) Speaker Support



April 2015 Laramie Rivers Conservation Expo booth and hoop house workshop (6) Conservation students and over 600 in attendance at the Expo.

January 2015 Powell Specialty Crop Food Hub (45) producers and consumers

February 2015 Cody Specialty Crop Conference on specialty crop opportunities

March 2015 Powell Food Hub Meeting for specialty crop producers

October 2015 Westex Restaurant Show (Estimated attendance 5000 leads generated 65)

\*The following out of State events were attended: Colorado Specialty Crop Field Day and the New Mexico Small Farm Conference.

\*As an advisor to the Wyoming Farmers Market Association, the position provided technical and marketing support on specialty crop topics presented at the 2014 WFMA convention that impacted 135 market managers and vendors. Support has been targeted to; education, season extension, research, food safety and product marketing/promotion.

Intern provided support on several specialty crop projects that included the 4H hoop house build at State Fair, developing and building a specialty crop display , updating of the specialty crop list, designing a specialty crop calendar and auditing the acidified food training in Cheyenne.

## GOALS AND OUTCOMES ACHIEVED

**Goal** – Increase the number of Wyoming Specialty Crop Producers.

**Benchmark** – The base line was estimated to be 261.

**Target** – Increase the number of producers and processors by 2.5% to 268.

**Performance Measure** – The number of new producers were gauged by analyzing Wyoming Ag Statistics, surveying farmer's market managers and the WDA Technical Services data base. 19 new producers were identified and added to the list of known specialty crop producers. A greater impact was the increase in the number of bee keepers tallied from county totals. The total number went from 238 in 2012 to 332 in 2015. This is not totally unexpected as the number of small acre land owners interested in bee keeping has risen sharply as evidenced by the popularity of the UWYO Bee College Conference over the last 2 years. Note the baseline of specialty crop producers according to USDA Ag Statistics was 436 of which 272 were pulse producers.

**Goal** – Promote the Specialty Crop Grants program through conferences and workshops.

**Benchmark** – Baseline is six (6) conferences/workshops received support

**Target** – Increase the number by 25% to six (8).

**Performance Measure** – 12 Conferences and workshops were supported either with speakers or booth and material displays. Feedback from conferences and workshops were analyzed and our selection of topics of interest was modified to include more hands on seminars. The informational material was in demand and we continually had to print additional materials after each conference or workshop. In addition a Small Acre Team sent out 15,000 surveys and

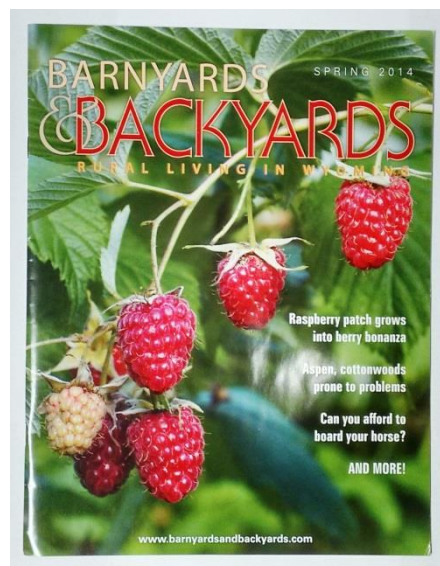
received 1297 responses for areas of interest of small acre owners. The survey results provided information for future specialty crop program direction. The following information was extrapolated from the respondents. 40% were interested in alternative energy, 37% on growing native plants, 36% on pest management, 34% on high tunnel and greenhouse production, 29% on weed control, 28% on wildlife habitat, 27% on windbreaks, 24% on reducing soil erosion, 22% on bee keeping and 20% on information related to vegetable and fruit production.

**Goal** – Promote the Specialty Crop Grants program through the publications.

**Benchmark** – Baseline is 8 articles/publications

**Target** – Increase the number by 1 to 9 an 11% increase

**Performance Measure** – The publications will be saved for the duration of the grant to track whether we have reached our target. The Backyard and Barnyard publication in the spring summer and fall 2013-14 magazines had 8 articles directly related to specialty crop production and harvesting. In addition summer the WBC Activities magazine featured 5 producers' stories who had all received season extension grants. These magazines reached over 3000 producers and consumers. Over 2000 pieces of updated promotional grant materials and information related to specialty crop production were distributed.



**Goal** – Promote Wyoming specialty crops outside of Wyoming.

**Benchmark** – Baseline needs to be developed

**Target** – Increase the sales/volume by 2%

**Performance Measure** – The number of phyto-sanitary certificates issued indicated that the total number of pounds of dry beans exported increased from 928,000 in 2012 to 6,308,633 a 600% increase in 2014. The amount of certified potatoes exported had dropped to zero in 2012 due to the loss of the Mexican market advantage but exports to Canada increased to 1,022,000 pounds in 2014. A survey of participants involved in Westex indicated that 64 leads had been generated at the show. One company indicated that approximately 50% of its business is generated from Colorado so this show was extremely valuable.

## BENEFICIARIES

The efforts by the position to build partnerships with Universities, Colleges nonprofits and producers were continued with is project. This is specifically evident in our pollinator efforts and the increase in bee keepers to over 300 registered on the WDA county lists. Nonprofit organizations have stimulated a multitude of community gardens, local food gatherings, producer workshops and other educational programs that heavily focus on specialty crop

production, processing and distribution. The University of Wyoming has developed a website for producers and back yard gardeners on hoop house construction and use at

<http://www.wyomingextension.org/whhin/>. The program manager helped train 110 students and individuals to build hoop houses in workshops, 74 producers/processors and 14 other agricultural professionals received training on acidified foods and 32 individuals on Good Agricultural Practices. At



four workshop and conferences 223 producers, processors and individuals attended seminars on specialty crop production and marketing. Specialty Crop materials were made available at conferences and workshops to almost 2400 producers, processors, consumers and agricultural professionals. The 40,000 plus visitors to the Wyoming State Fair were exposed to multiple

specialty crop displays now managed by the Master Gardeners and Douglas 4H Club. The heritage apple trees planted there continue to provide an educational opportunity on the diversity of apples from the past.

## LESSONS LEARNED

The funds that support this positions travel and the marketing efforts have expanded the production and consumption of specialty crops in Wyoming. Not only is there a continuing need to educate the existing producers, processors and consumers but the program must continually address the needs of new producers and processors. With the hiring freeze instituted in 2015 and the loss of help for the program the WDA will have to increase cooperation and leverage other State agencies, institutions, nonprofits and local governments even more so than in the past.

## CONTACT INFORMATION

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## WYOMING AGRICULTURAL PRODUCER, PROCESSOR, PROFESSIONAL AND STUDENT SPECIALTY CROP EDUCATIONAL OPPORTUNITY SCHOLARSHIP GRANT PROGRAM

### PROJECT SUMMARY

The impetus for the project was to impact as many specialty crop producers as possible with current information on specialty crops. This was done by providing scholarships to individuals to attend national and state wide conferences and take the information gained and share it at a local level. Wyoming is still a very rural State and the project helped address the fact that producers trust and turn to their neighbors first for information and help. The Wyoming Specialty Crop Program has previously offered small educational scholarship grants to increase knowledge of specialty crop producers, processors, agricultural professionals and students on production, marketing, promotion and food safety of specialty crops. This project continued these opportunities for Wyoming individuals to be able to take advantage of conferences and trainings both in-state and out-of-state. The project provided small scholarship grants to cover eligible expenses related to the workshops, training or conferences. Thirty four grants were awarded with the requested funds.

### PROJECT APPROACH

An application and brochure were created posted on the WDA website and distributed at conferences and trade events.

#### Scholarship Program

#### Wyoming Specialty Crop Grant Program

#### Guidelines

#### ELIGIBILITY REQUIREMENTS

Wyoming farmers/ranchers, processors, students and agricultural specialists are eligible to apply for a Wyoming specialty crop scholarship grant if they meet one of criteria 1, 2, 3 or 4 and criteria 5 and 6 and 7.

1. A Wyoming-based specialty crop producer as defined by USDA.
2. A Wyoming licensed specialty crop processor.
3. A Wyoming Agricultural Specialist directly involved in specialty crop production or marketing.
4. A Wyoming graduate or undergraduate student whose discipline relates to specialty crop production, processing promotion or consumption.
5. Demonstrate that they are capable of capitalizing on training that will enhance specialty crop production techniques, processing, marketing and/or distribution in Wyoming.
6. Has received a recommendation from a local Wyoming agricultural organization that can vouch for their involvement in specialty crop production.

7. Be willing to share information gained at in-state event.

**Eligible expenditures** are limited to airline travel, mileage to the training, meals, lodging and registration for the approved trainings, conferences and events scheduled to take place on or before September 28, 2015.

**Ineligible expenditures** include, but are not limited to expenditures directly related to salaries.

#### **AWARD LIMITATIONS**

**This is a matching program.** Farmers and ranchers, processors and agricultural professionals involved in specialty crop production, education or marketing may receive a maximum grant award of \$1000 for out-of-state or \$300 for instate events. The total grant award is limited to  $\frac{3}{4}$  of the actual eligible expenditures up to \$1000, whichever is less.

#### **REQUIREMENTS OF THE PARTICIPANT**

**Documentation.** The farmer/rancher, processor agricultural specialist must complete and submit to the Wyoming Department of Agriculture the following forms for reimbursement: 1) *Request for Reimbursement*; 2) *Itemized Expenditure*; and, 3) a *Final Report* on the grant by Sept 28, 2015. Copies of canceled checks (both sides), invoices, and other confirmation of payment must be submitted for reimbursement.

#### **APPLICATION PROCESS**

Potential participants of the Wyoming specialty crop producer, processor or agricultural specialist scholarship program must complete and return the application and the required attachments up to **30 days prior to the event**, conference or trainings in order to allow sufficient time for the application to be reviewed. Late applications may not be reviewed for consideration.

#### **PLEASE NOTE:**

1. Expenditures incurred without written or electronic confirmation from the Wyoming Department of Agriculture are NOT eligible for reimbursement.
2. **The application process may not be started after the company has attended a grant related training event.**

#### **GENERAL GRANT INFORMATION**

The Wyoming Specialty Crop Scholarship Grant Program is a reimbursable grant; as such, the applicant must pay all expenditures before the grant award can be disbursed. The business shall function independently in performing this activity and shall assume sole responsibility of any debts or liabilities that may be incurred in regard to this grant. The grant award cannot be assigned.

#### **Scholarship Program**

#### **Wyoming Specialty Crop Grant Program**

#### **For Producers, Processors and Agricultural Specialists**

1. Applications should to be typed, single spaced and in 12 point font.

2. Each page should be numbered, with applicant's name at the top of each page.
3. Application packets should not exceed 10 pages including supplemental documentation.
4. An electronic version of the application packet (in MS Word format) must be submitted to one of the email addresses listed in the contact information.
5. Submit ONE complete original application packet signed by the person authorized to receive funds and mail to Wyoming Department of Agriculture at the address below.

***Submission of Application***

1. An electronic grant application must be emailed to the contacts below no later than **August 29, 2015. Applications must be received by the grant deadline.** Applications that do not adhere to this deadline will not be accepted.
2. A signed printed copy of the application must be mailed to the Wyoming Department of Agriculture at the address below no later than Wednesday September 28, 2015.

A signed hard copy must be mailed to:  
 Wyoming Department of Agriculture  
 Specialty Crop High Tunnel Grant Program  
 2219 Carey Avenue  
 Cheyenne, Wyoming 82002

The program was promoted at the following events:

February 2014 Westi Days (Specialty crop booth) (Attendance 120)

February 2014 Fremont County Farm and Ranch (Specialty crop booth) (310)

February 2014 Idea Conference (Specialty crop booth) (210)

March 2014 Wyoming Farmer Marketing Conference (Specialty crop booth) and specialty crop seasons (135)

March 2014 Laramie Conservation Expo (Specialty crop booth) (640)

March 2014 At Bee University provided support for speaker cost and supplies (140)

April 2014 provided a poster presentation at the National Farm to School Conference on our work with schools on our hoop houses as outdoor classrooms.

July 2014 WDA presented on "High Tunnels as Outdoor Farm to School Classrooms" at the 2014 National Children and Youth Garden Symposium

August 2014 Wyoming State Fair Several displays showcasing specialty crops (40,000 plus attendees)

August 2014 Boys and Girls hoop house workshop (8) plus 40 in summer program benefited.

October of 2014 Lusk School hoop house workshop (82) students and teachers

October 2014 Lander Localfest booth display of specialty crop materials (265)

October 2014 Casper Farm to School

October 2014 Wheatland Specialty Crop Conference (19)

December 2014 Wyoming Bee Keepers (24)

April 2015 Laramie Rivers Conservation Expo booth and hoop house workshop (6) active workers and over 600 in attendance at the Expo.

January 2015 Powell Specialty Crop Food Hub (45)

## GOALS AND OUTCOMES ACHEIVED

**Goal** - Increase specialty crop education, production, and consumption through increasing the knowledge of specialty crop stakeholders by increasing the number and knowledge of producer and agricultural professional speakers available to share information on specialty crop production, processing, marketing and food safety.

**Benchmark** - In 2009-11 there were 6 individuals who received out of state scholarships to increase their knowledge and either spoke at instate conferences or workshops impacting an additional 250 people.

**Target** - Through the utilization of scholarships the number of available speakers with increased knowledge, will increase 50% from 6 to 12 and the number of additional people impacted by the speakers will increase to 500.

**Performance Measure-** Wyoming Community Network monitored the progress toward this goal by requiring reports that gauged the effectiveness of the scholarships increasing the knowledge of the recipients to ensure compliance with specialty crop program and that the knowledge they obtain is passed on at in-state conferences and workshops. Surveys/reports for the conferences and workshops were done to gauge increase in knowledge of the grantees. Ten individuals received scholarships to attend out of state conferences. One grantee has since used the knowledge gained at the American Bee Keepers Conference to instruct 40 new master gardeners in 2014 and 2015. She also organized the Wyoming Bee College which directly impacted approximately 280 producers and consumers to date. The report indicated that her knowledge of the topics covered had increased by over 30%. A second scholarship provided an increase in knowledge of 35% on edible landscape design for the company that provided equipment to the US Pavilion's Living Wall at the 2015 World's Fair. Two other scholarships provided company representatives with knowledge on export marketing. One indicated that their knowledge on export marketing had increased by 50% and the second by 10%. Six master gardeners with the help of the scholarship program were able to attend the National Master Gardeners Convention with an average increase in knowledge of 22% and will be able to provide coaching for new master gardeners in northern Wyoming.

**Goal-** Provide an opportunity for producers, processors and students to increase their knowledge by attending in-state conferences and workshops. .



**Benchmark-** There were 59 students and producers who increased their knowledge through scholarships between 2009-2011 at in-state conferences.

**Target-** 20 scholarships will be offered in this funding cycle to increase knowledge of a minimum of 20 producers or agricultural students.

**Performance Measure** - Wyoming Community Network managed the grant program and the WDA promoted it. The recipients were surveyed to determine the level of increase in knowledge on specialty crop related topics. The instate scholarships were awarded to 24 producers, processors and agribusiness professionals to attend the following instate conferences and workshops: Acidified Food Certification (6), Gap Training Workshop (15) , Western US Ag Trade Association export training workshop (1), Farm to School workshop (1) and UWYO Specialty Crop Workshop(1). The six Acidified food scholarship recipients who averaged an increase in knowledge of 36% received a certificate of completion needed to legally process acidified foods for sale to commercial establishments according to FDA regulations. The GAP scholarship recipients surveyed showed that most were starting from very little knowledge of the new GAP requirements as required by the Food Modernization Act. They increased their knowledge by an average of 33%. The producer who attended the WUSATA Export training reported a 70% increase in knowledge. The Farm to school scholarship recipient indicated a 15% increase in knowledge and the specialty crop workshop recipient a 10% increase.

## **BENEFICIARIES**

Beneficiaries of the scholarship program included not only the 34 recipients but those they impacted. Two of the scholarships were for individuals that are directly supporting either school gardens or growing for the local schools. The impact on their activities is not measureable but their increase in knowledge will benefit multiple schools and hundreds of students. The individuals who received out of state scholarships have had a broad impact on other producers and consumers. One scholarship helped generated the development of an instate Bee College which impacted and additional 280 plus beneficiaries. State wide there are over 400 master gardeners who benefit from 6 of their own attending the national conference. There are 272 pulse producers that will benefit from a Wyoming handler attending the US Dry Bean convention to keep up with the changing market conditions. Consumers purchasing and consuming value added products form the individuals attending the Acidified food trainings will also benefit from safer food preparation.

## **LESSONS LEARNED**

Wyoming producers large and small have benefited from this program. The long term impacts of trainings are sometimes hard to measure but some have very immediate outcomes such as



safer food. The program has proved to be of value to the specialty crop industry as a whole as multiple sectors and operation sizes have benefited.

#### **CONTACT INFORMATION**

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## **WYOMING FARMERS MARKET REGIONAL SPECIALTY CROP EDUCATION WORKSHOPS AND ANNUAL CONFERENCE**

### **PROJECT SUMMARY**

The overall purpose of the project was to continue to provide information to farmers' market management and vendors on specialty crop production, marketing and food safety. Wyoming Farmers' Markets have increased considerably over the past several years, from 12 markets in 2004, to 50 markets in 2012. The annual Wyoming farmers' market conference assisted in increasing the number of markets and raising the level of expertise of market managers and vendors. This was done through educational sessions that provided information on food safety, food production, food preservation, marketing and promotion. Additionally, it continued to support and encourage the networking of market managers, and vendors within the state. Previous Specialty Crop grants supported the development of the Farmers Market Manager manual and certification course. Feedback from the managers indicated that the manual and course were very beneficial in helping them with vendor and consumer problems that arose in their respective markets. The state wide interaction between managers and vendors was felt to be an extremely valuable part of building the farmers' market community. In order to increase the opportunity for managers and vendors that were unable to attend the annual conference, two day long acidified food workshops were funded through the grant in underserved corners of the state. The Farmers Marketing Association continued to bring in expert speakers on specialty crop production, marketing, food safety and food preservation at the 2013 and 2014 conference and the two regional workshops. It supported through marketing to its members additional food safety workshops in Casper and Torrington.

### **PROJECT APPROACH**

The project was designed to increase the knowledge of farmers' market managers and vendors by providing expert speakers on topics relative to specialty crop education, production, and consumption. Market vendors look to the market manager to be knowledgeable on all the rules and regulations that they need to follow in order to sell their produce. Managers look to producers to provide a variety of specialty crops necessary for a successful market. The Farmers Marketing Association recruited expert speakers on specialty crop related topics to speak at the annual conference and workshops.

In December 2012 and January of 2013 the Wyoming Farmers Marketing Association met and developed a proposed list of topics and set March 9 2013 for conference date in Laramie. The topics were finalized after contacting speakers to determine availability.

Seminar speakers included:

Dr. Steve Miller, Professor – University of Wyoming

○ Apple Trees and Tomatoes: Grafting and Growing  
Cindy Ridenour – Meadowmaid Foods

○ Providing Habitat for Predators and Pollinators  
Chris Moody/Deborah Kassner

○ Pollinators  
Larry Anderson – US Small Farms

○ Simple Technology for Small Farm Production  
Nate Storey – Bright AgroTech

○ Vertical Farming  
Jerry Simonsen/Carol Morrison – Goshen County Master Gardeners

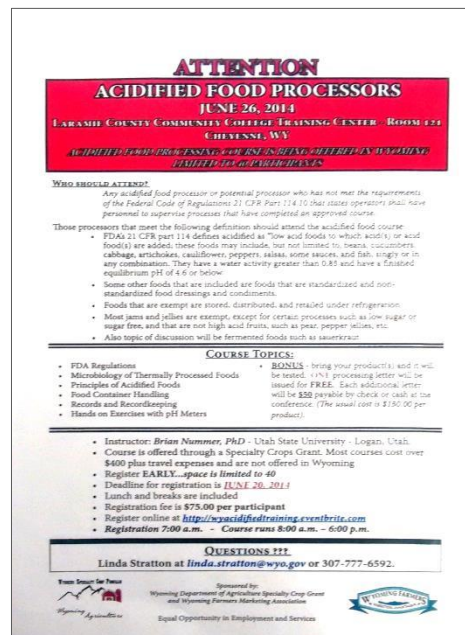
○ Marketing Displays  
Renee King – University of Wyoming

○ Feeding the Soil for Quality

A conference schedule and brochure were created to market conference.



The 2013 Conference was then advertised on the Wyoming Farmers Marketing website and through the University of Wyoming, Wyoming Department of Agriculture and the Wyoming Business Council.



Acidified food training were scheduled and conducted in Riverton in June of 2013 and Cheyenne in June 2014. The purpose of the trainings were to educate producers wishing to

provide acidified foods for sale and to have their recipe reviewed to ensure safety in preparing a product to be served to consumers and receive a processing letter that allows them sell wholesale and to sell out of state. With support of specialty crop funds our producers were able to participate at a much lower rate. Traveling to out of State classes would have averaged between \$500 and \$1000 per company.

The agenda for training in Riverton

Acidified food training

June 25 & 26, 2013

Riverton Branch Public Library – Community Room

1330 W. Park Avenue, Riverton, WY

Agenda:

Day 1.

8 - 9 am | Welcome and Registration

9 -10 am | Overview and Food Categorizations

10 - noon | Food Microbiology Hazards

noon - 1 pm | Lunch on your own

1 - 2:30 pm | Thermal Processing & Equipment

2: 30 - 2:45 pm | Break

2:45 - 4:15 pm | Non-Thermal Processing and Preservatives

Day 2.

8:30 - 10 am | Sanitation and GMPs

10 - noon | Standard Operating Procedures

noon - 1 pm | Lunch on your own

1 - 2:30 pm | HACCP for Thermal Processing

2: 30 - 2:45 pm | Break

2:45 - 4:15 pm | Regulations and Forms

In January of 2014 the Wyoming Farmers Marketing Association and the Wyoming Master Gardeners developed the proposed list of topics and set March 13 and 15 of 2014 for conference date in Sheridan Wyoming. The topics were finalized and speakers were identified. The 2014 Annual Conference was held in Sheridan, WY March 13-15, 2014. The Wyoming Farmers Marketing Association (WFMA) and Wyoming Master Gardeners (MG) partnered to offer an opportunity for both WFMA Members and MG members to network with one another and gain knowledge from expert

The collage consists of four documents:

- Thursday, March 13, 2014:** A schedule for the first day of the conference, including a 9:00am-5:00pm session for WFMG Manager Certification (Put on by WDA) at the Best Western Sheridan Center Ballroom. Lunch is included. A 5:00pm-7:00pm session for Registration and Welcome is also listed.
- Friday, March 14, 2014:** A schedule for the second day, featuring a 9:00am-11:00am session for Hands-On Workshops at Sheridan College (Classroom 100). Topics include Food Preservation (In Home Use Only) and Food Safety (Food Safety). A 11:00am-12:00pm session for Lunch and Networking is also listed.
- Saturday, March 15, 2014:** A schedule for the third day, featuring a 9:00am-11:00am session for Hands-On Workshops at Sheridan College (Classroom 100). Topics include Food Preservation (In Home Use Only) and Food Safety (Food Safety). A 11:00am-12:00pm session for Lunch and Networking is also listed.
- Registration Form:** A form for the 2014 Wyoming Farmers Marketing Association and Wyoming Master Gardeners Annual Conference. It includes fields for Name, Address, Phone, Email, and a section for Registration Fees. The form also includes a Cancellation Policy and a section for Registration and Payment.

speakers and trainers. The conference was heavy on hands-on specialty crop topics as well as informational sessions. Speakers and topics included:

- Curtis Haderlie (Wind River Herbs) – Herbs
- Donna Cuin (UW Extension Natrona County) – Cut Flowers
- Renee King (UW Doctoral Student) – Sustainable Ag: Soil Maintenance
- Clifford Reed – Bees/Pollinators
- Andrew Nowak (Slow Food USA) – Slow Food: Eating In
- Sadinand Dhekney (University of Wyoming) – Hands On Grapes/Vineyards
- Steve Miller (University of Wyoming) – Hands On Fruit Tree Grafting
- Kentz Willis (UW Extension) – Hands On Food Preservation
- Tyler Mason (Cheyenne Botanical Gardens) – Hands On Tomato Grafting
- Linnea Skoglund (Montana State University) – Common Diseases in Vegetables and Ornamentals
- Chris Hilgert (Wyoming Master Gardeners) – Hands On Fruit Tree Pruning

A Market Manager Certification course was held prior to the two day conference. The event provided market management information for new and existing managers to keep up with changing food safety legislation, marketing and conflict resolution.

A second Acidified Food Processing Training was held in June 2014 in Cheyenne. The acidified trainings were extremely popular and two additional trainings were scheduled and held in April of 2015 in Jackson and Powell Wyoming.

The following are a list of producers and organizations involved in making this project a success:

**Farmer Market (FM)/Master Gardener (MG) Groups:** Platte County Farmers Market, Campbell County Master Gardeners, Bridger Valley FM, Evanston FM, Big Horn Basin FM, Laramie Local Foods, Goshen County MG, Main St. Douglas, Lander Valley FM, Sheridan FM, Red Dirt MG, Downtown Buffalo

**Producers:** Meadow Maid Foods, WY Worm Wrangler, Stiver Vineyards, Happy Jack Harvest, Hillside Spirit Farm, Shiloh Valley Farm, Ellis Harvest Home, Antelope Gap Dream Berries, Bren's Hens, Mitzel Farms, Bright Agrotech

**Organizations:** University of Wyoming Extension, City of Laramie, Laramie Rivers Conservation District, Wyoming Department of Agriculture, Sweetwater Extension, Wyoming Master Gardeners, Downtown Sheridan, Cheyenne Children's Botanical Gardens, Slow Food USA Wyoming Business Council

## GOALS AND OUTCOMES ACHIEVED

**Goal** - The goal of the project was to increase the knowledge of farmers' market managers and vendors by providing expert speakers on topics related to specialty crop education, marketing, production, and consumption.

**Benchmark 1-** When moved from Laramie in 2012 to Riverton the number of people attending the conference decreased from 110 to 51 due to the location.

**Target** – We expected to increase the knowledge of approximately 150 market managers and producers by offering additional regional Farmers Market workshops in the underserved areas of the state as well as the annual conference.

**Performance Measure** – Wyoming Farmers Marketing Association tracked the number of managers and producers in attendance at the 2013 conference (48 a snow storm reduced the attendance numbers), the 2014 conference (123) and workshops in Riverton (39), Cheyenne (49). 2013 conference attendees were asked to evaluate the conference upon completion. Of the surveys returned, 100% of the participants said the sessions and speakers at the conference helpful and provided good information. Additional choices for sessions on the survey were “not helpful” and “neutral”. Participants were also given to option to suggest topics for the next conference as well as to provide comments on the conference. Of the 2013 specialty crop speakers, the vertical growing and pollinator's sessions were most well received. These topics were also suggested for a more in depth or extension of the training for the next conference. Producers were able to utilize information on food safety ensuring their marketable products were produced, transported and sold to the end consumer in a timely and safe manner.

The 2014 Conference was held jointly with the Wyoming Master Gardeners with an attendance of 123. Over a hundred people attended each day some being single day registrants. The following are the specialty crop related topics. The attendees were survey and the courses were rated between 1-5 for value of information provided to increase knowledge.

- Curtis Haderlie Wind River Herbs\_ Herb Production and Processing (87%)
- Donna Cuin UWYO Extension-Cut Flowers (88%)
- Renee King UWYO -Sustainable Soil Management for Specialty Crops (97%)
- Clifford Reed= Bees and Pollinators (80%)
- Andrew Novak, Slow Food – School Gardening (97%)
- Sadanand Dhekney UWYO -Hands on Grape vine/ Vineyard (100%)
- Steve Miller UWYO -Apple Tree Grafting (94)
- Kentz Willis UWYO -Hands on Vegetable Fermentation Preservation (97%)
- Tyler Mason Cheyenne Botanical Gardens -Tomato Grafting (87%)
- Linnea Skoglund MSU -Common Diseases in Vegetable and Ornamentals (93%)
- Chris Hilgert UWYO -Hands on Fruit Tree Pruning (100%)

The Acidified Food Processing Trainings provide the highest increase in knowledge as all attendees (88 for Riverton and Cheyenne), had to increase their processing knowledge to between 70% and 100% in order to pass. Prior to the training not one person indicated they had any experience in the hot and hold method of acidified food preservation. Those already processing acidified foods were using the older technique of preservation. In order to receive their certificate they were given a test to determine if they were proficient to supervise acidified food preservation. For their products to receive a processing letter they had to provide their method of processing which was reviewed to determine its level of safety. Only those that passed the various food safety tests were awarded a processing letter. Those that needed modification were given instruction as to the changes that were needed to be made in order to receive a processing letter.

## **BENEFICIARIES**

Annually the Farmers' Market Manager conference attracts market managers, agricultural professionals, producers, processors, vendors and master gardeners but its benefits go far beyond them. The ultimate beneficiaries are the Farmers' Market consumers whose experience at the markets will be improved due to better management and more diverse specialty crop availability. Those directly impacted included 88 individuals who attended two acidified food training, 63 market managers who attended the Farmers market Certification training and 170 producers, market manager, master gardeners and agricultural professionals who attended the 2013 and 2014 Farmers Marketing Conference. Participating in the training and workshops provided individuals with necessary tools to more efficiently run their markets and businesses thus increasing income and customer base. Producers were also able to benefit through learning marketing, growing and preserving products.

## **LESSONS LEARNED**

This project proved education and communication are vital to any program, but especially when working with producers and consumers. Producers were very concerned about providing a safe and quality product to consumers, but often are not familiar with regulatory requirements. Some of these regulations can cause the process of producing a safe food product to be more expensive for smaller producers. This project provided trainings and workshops designed to help producers effectively make and market their products in a safe and more cost effective manner. The most important lesson learned during the project was the importance of partnership. With producers, nonprofit organizations and agencies involved, it was one step closer to having everyone working together toward the same common goal of increasing specialty crop production, processing and consumption. Although many are quite

capable on their own, the opportunity to work with others doing like things was extremely beneficial. The success of the project revolved around the importance of community.

#### **CONTACT INFORMATION**

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## **TRAIN THE TRAINER HIGH TUNNEL CONSTRUCTION AND USE PROGRAM FOR SPECIALTY CROP FOOD PRODUCTION**

### **PROJECT SUMMARY**

This proposal requested funding in order to support 3 (three) high tunnel workshops conducted in Wyoming while training an additional workshop trainer. Workshops included the construction of one high tunnel per location and education of producers on the reality and benefits of specialty crop production using high tunnels. Workshops also had the goal of instructing of an apprentice trainer. The goal of this project to gain interest in the use of high tunnels and encourage the adoption of their use for the production of fresh commodities for the farmer's markets in Wyoming while training at least one other individual interested in continuing additional workshops around the state. Over time roles and responsibilities change. The PI has had great success with high tunnel programming/education in the state, however new responsibilities have started to chip away at the amount of time to continue educational programs concerning high tunnels. Training additional trainers allowed the program to continue to meet the demand by producers and organizations in the state as to the instruction concerning construction and how to use high tunnels for specialty crop food production.

### **PROJECT APPROACH**

Enough of these workshops have been conducted in the state that there is a general knowledge that the University of Wyoming and the Wyoming Department of Agriculture are the "go to" sources for information and the possibility of conducting workshops

A total of three high tunnel educational workshops were proposed by this grant and locations were identified

1. A total of three high tunnel educational workshops were approved to be funded by this grant.
2. Worked with local representatives to establish schedule and time line for construction.
3. Project owners were notified that their location had been selected for a workshop.
4. Project owners organized workshop participants.
5. For each event worked with project owners to promote event through advertisement. PI developed materials for each project. Project owner responsible for publicizing and recruitment of workshop participants. (See attached under additional information – samples 1 and 2).
6. Prior to each build - Purchased supplies for builds as needed.
7. Materials were transported to workshop locations.
8. The high tunnel structures were built by participants in a "learn by doing environment".



## HT Project Summaries

Table 1. Summary of High Tunnel Projects								
Grant count	Structure Count	Date	Location	County	Project Summary	WDA HT Grant Usage (Materials)	Participants	Farmable Square feet
0	1	Jul-13	Wheatland	Platte	20 X 48 Hard sided	NA	125	960
0	1	Sep-13	Pinedale	Sublette	Traditional Hoop 16X32	NA	24	512
1	1	Jun-14	Douglas	Converse	Modified Traditional Hoop 15 X32	\$1,600	8	480
1	1	Jul-14	Kaycee	Johnson	Modified Traditional Hoop 16 X32	\$ 1,715.20	8	512
0	1	Aug-14	Hewlett	Crook	Modified Traditional Hoop 16 X32	NA	6	512
1	3	Oct-14	Lusk	Niobrara	3 X Modified Traditional Hoop 16 X32	\$ 5,145.60	82	1536
0	1	Apr-15	Laramie	Albany	Traditional Hoop 12 X 12	NA	6	144
0	1	May-15	Gillette	Campbell	Traditional Hoop 12 X 12	NA	6	144
0	1	May-15	Cheyenne	Laramie	Traditional hoop 16 X 32			512
0	1	Sep-15	Ft. Washakie	Fremont	Traditional hoop 16 X 32	NA	8	512
3	12					\$ 8,460.80	273	5824

**Goal:** To train an additional educator on how to conduct high tunnel workshops and their potential use for specialty crop production in Wyoming and be able to conduct additional workshops in the state.

**Benchmark:** NA

**Target:** Train at least one additional educator how to conduct high tunnel workshops.

**Outcome:** One individual from UW Extension was identified and trained to conduct workshops in the future. His knowledge base of hoop house construction increased from no knowledge being competent to conduct high tunnel workshops a 100% increase in knowledge. He was put in charge of the tool trailer and also identifying build opportunities in the state. The new trainer completed one workshop with 6 participants on his own in Sundance, WY. A second workshop has been confirmed that will occur April 2016 in Lander, WY. Approximately two additional workshops are in discussion as well. The PI will continue to work with the new trainer on several future build projects in order to help continue to provide additional guidance as needed.

### BENEFICIARIES

This grant allowed for the continued implementation of hands-on educational workshops for Wyoming residents in the how-to construction of high tunnels. These workshops were able to remove factors that can be intimidating in the construction process, encouraged the use of local materials and utilized simple yet sturdy designs that would survive Wyoming's challenging weather conditions. 273 participants were exposed to hands on building of high tunnels using local materials. Public participation in the workshops and seminars continued to exceed all expectations. This project encouraged hands-on learning and the opportunity to discuss unexplored methods (by the general public) of crop diversity and production. The possibility of

building a low cost-high tunnel that provides protection against Wyoming's variable growing conditions and extends the growing season piques the interest of all frustrated backyard and commercial producers of food. These workshops last for 6 to 24 hours of hands-on instructional learning each, this time frame provided ample opportunity to educate participants on the construction of these structures. Other educational discussions provided during the workshops included: the benefit of extending the growing season; how-to-grow traditional and non-traditional crops (items not usually produced in a traditional Wyoming garden setting) and pest control strategies. The project owners whether Master Gardeners, University Extension staff, or educators, who manage these structures for demonstration or production of crops benefit local communities. The three primary locations for this grant included two boys and girls clubs and a middle school. All three locations are incorporating produce grown into their food service programs. All were placed in locations where they are being utilized as teaching/learning/and production tools.



## LESSONS LEARNED

The degree of high tunnel utilization appears to be a matter of vested ownership. Schools and public entities with at least one individual interested in operating the high tunnel and using it as an educational opportunity seem to be thriving. Training another individual to conduct workshops was very challenging. Although the model for building these structures is the cookie cutter approach the need for the trainer to have the ability to improvise is critical. No two structures are exactly the same due to ground terrain, windiness of site, and the skill of the attendees. It has proven necessary to take a team approach and have two people available to conduct a workshop in certain situations where construction needs more customization.



## CONTACT PERSON

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Pesticide Applicator Training Coordinator and  
State Small Acre/Horticulture Specialist  
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SAREC  
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(307) 837-2956



## ADDITIONAL INFORMATION

The Small Acre issue team responsible for publication of Barnyards and Backyards conducted a land owner survey in 2015. The Survey was completed by representative subsample of individuals who either own or manage between 5 and 160 acres in the state of Wyoming (ca. 1200 respondents). Respondents indicated that the use of high tunnels or greenhouses in Wyoming was in the top 5 critical information needs for these property owners/managers.

Wyoming Hoop House Information Network – University of Wyoming Extension Website

<http://www.wyomingextension.org/whhin/>

How to build a High Tunnel publication – University of Wyoming Extension publication

<http://www.wyoextension.org/agpubs/pubs/B1240.pdf>

Insect and Mite Control in Greenhouses [High Tunnels] – Author reference material

<http://www.uwyo.edu/barnbackyard/files/documents/resources/insects/htinsectcontrol2013.pdf>

Various published articles related to hoop houses

<http://www.uwyo.edu/barnbackyard/files/documents/magazine/2011/fall/102011bbfeaturedlandownerhightunnel.pdf>

<http://www.uwyo.edu/barnbackyard/files/documents/magazine/2011/summer/072011bbhightunnelsurprises.pdf>

Edwards, J.M. “101 (almost) ways for a high tunnel to die”. Barnyards & Backyards. Fall 2014.

Edwards, J.M. “Ask Sam – Which way should a hoop house be oriented?” Barnyards & Backyards. Summer 2013.

Edwards, J.M. “High Tunnel Insect and Mite Control”. Barnyards & Backyards. Spring 2013.

Edwards, J.M. “Featured landowner: High Tunnels, high production and the high life”. Barnyards & Backyards. Fall 2012.



THANK YOU!



FOR ALL THAT YOU HAVE DONE TO  
MAKE OUR HIGH TUNNELS  
POSSIBLE AT LUSK

MA

## SEASON EXTENSION PRODUCER SMALL GRANT PROGRAM

### PROJECT SUMMARY

The need to continue to increase both early and late season production of weather sensitive vegetables in Wyoming was the primary motivation for this project. Through previous USDA specialty crop grants, Wyoming has offered small grants to producers and to develop and promote methods that extended or increased specialty crop production and consumption. The program has seen multiple years of success and has proven to be one of the most productive ways Wyoming has enhanced the specialty crop program in the state for small acreage producers. Since the inception of the program over 35 grants had been awarded for producer high tunnels, irrigation systems, and other season extension methods. High tunnels built in Wyoming have been shown to increase growing season, quality, and quantity of product. These tunnels were built to withstand Wyoming wind, temperature, and hail. They also resulted in reduced water usage through drip irrigation and an increased the variety of specialty crops available. This funding opportunity complimented the high tunnel “Train the Trainer” and high tunnel workshop projects coordinated by UWYO Cooperative Extension Service by providing additional grant opportunities to participants of workshops.

### PROJECT APPROACH

The goal of the project was to increase specialty crop education, production, and consumption through season extension techniques and water conservation efforts by providing small grants (not to exceed \$3,500) to Wyoming producers. Grants included high tunnels, low tunnels, row covers, high tunnel water conservation systems, and other methods that will extend or increase specialty crop production, processing, promotion, education, and consumption in Wyoming. Seven to eight grants were to be awarded with the requested funds. This small grant program enabled small specialty crop producers to provide a greater range of produce for a longer period of time. This program also offered producer grant opportunities to UWYO Cooperative Extension workshop participants who planned on building a hoop house to diversify into or expand their specialty crop production.

### ACTIVITIES PERFORMED

Eight small grants were awarded to producers to increase specialty crop education, production, and consumption. Eligible grants focused on season extension high and low tunnels, water conversion techniques, and other methods that helped increase knowledge of specialty crop production. The application and guidelines were updated and marketed through media releases, at trade events meetings and conferences. Application process included submitting an application, budget, and letter of support from a local entity that vouched for an applicant's

involvement in agriculture production. Applications were reviewed by the WDA and WCN for approval if they met the programs requirements and had multiple impacts greater than the applicants operation. They are then informed by email of their successful application. After completion of the project they are required to fill out a request for reimbursement that includes final report, copies of invoices and proof of payment. In order to determine whether an applicant is eligible they are encouraged to read the requirements of the grant online or to call the WDA or the WCN first. Grants were reviewed on a first come first serve basis but preference would be given to producers who are first time applicants. If grant application did not show multiple impacts they were encouraged to reread the power point of a sample grant on what are considered acceptable multiple impacts and resubmit their application.

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## **PRODUCER HIGH TUNNEL/SEASON EXTENSION GRANT WYOMING SPECIALTY CROP PROGRAM**

### **Guidelines**

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#### **PURPOSE**

Small grants will be awarded to specialty crop agri-business operations to develop methods for increased productivity through season extension techniques.

#### **Eligibility Requirements**

Wyoming farmers/ranchers are eligible to apply for a Wyoming Specialty Crop Grant if they meet the following criteria:

1. Be a private-sector Wyoming-based agricultural producer as defined by USDA.
2. Demonstrate that producer is capable of capitalizing on methods that will enhance their specialty crop production through season extension techniques.
3. Has received a recommendation from a local entity or individual that can vouch for your involvement in agricultural production.

**Eligible expenditures** are limited to materials only necessary to construct high tunnels, low tunnels, high tunnel drip irrigation systems, raised beds and row covers.

**Ineligible expenditures** include shipping expenses, travel such as lodging and meals and mileage, and expenditures directly related to the operation of the business such as salaries, contract labor or rental equipment.

#### **AWARD LIMITATIONS**

**This is a matching program.** The total grant award is limited to 75% to a maximum of \$3500 of the actual eligible expenditures per year. The minimum amount of a grant is \$500. Each Agri-business is limited to no more than \$7000 over the life of the season extension program.

#### **REQUIREMENTS OF THE AGRIBUSINESS PARTICIPANT**

**Documentation.** The Farmer/Rancher must complete and submit to the Wyoming Department of Agriculture the following forms for reimbursement: 1) *Request for Reimbursement*; 2)



*Itemized Expenditure*; and, 3) a detailed electronic and hard copy *Final Report* on the grant before September 28, 2015. Copies of canceled checks (both sides), other confirmation of payment and invoices must be submitted for reimbursement.

## **APPLICATION PROCESS**

Potential participants of the Wyoming Specialty Crop Grant Program must complete and return the application and the required attachments by August 1, 2015 to the Wyoming Department of Agriculture, Specialty Crop Grant Program, Producer High Tunnel /Season Extension Grant, 2219 Carey Ave. Cheyenne, WY 82002

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**PLEASE NOTE:** Expenditures incurred without written or electronic confirmation from the Wyoming Department of Agriculture are not eligible for reimbursement. **The application process cannot be started after the company has purchased the materials or supplies for the project.**

## **GENERAL GRANT INFORMATION**

The Wyoming Specialty Crop Grant Program is a reimbursable grant; and as such, the applicant must pay all expenditures before the grant award can be disbursed. The business shall function independently in performing this activity and shall assume sole responsibility of any debts or liabilities that may be incurred in regard to this grant. The grant award cannot be assigned.

**\*\*\*This program has a limited amount of funds. Preference will be given to qualified first time applicants and the Wyoming Department of Agriculture reserves the right to deny applications that are not complete or otherwise deemed not eligible**

## Producer High Tunnel /Season Extension Grants

### WYOMING SPECIALTY CROP GRANT PROGRAM

#### **Application Format and Submission Requirements**

6. The proposals should be typed, single spaced and in 12 point format.
7. Written proposals must be printed and legible or will not be accepted.
8. Each page should be numbered with applicant's name at the top of each page.
9. Application packets should not exceed 10 pages including supplemental documentation.
10. An electronic version of the application packet (in MS Word format) must be submitted to the email addresses listed in the contact information.
11. Submit ONE complete original application packet signed by the person authorized to receive funds and mail to Wyoming Department of Agriculture at the address below.

#### ***Submission of Application***

3. An electronic grant application must be emailed to the contacts below no later than **August 1, 2015. Applications must be received by the grant deadline.** Applications that do not adhere to this deadline will not be accepted.
4. A signed printed copy of the application must be mailed to the Wyoming Department of Agriculture at the address below no later than August 1, 2015.

**A signed hard copy must be mailed to:**

Wyoming Department of Agriculture  
Producer High Tunnel/Season Extension Grants  
Wyoming Specialty Crop Grant Program  
2219 Carey Avenue  
Cheyenne, Wyoming 82002

**The following grants were awarded and projects completed:**

Chris Sherrard  
Janis Rock Greenhouse  
Good to Grow  
Sheila Bird Farms  
Patch Ranch  
Chanda Rule  
Earnie Schierwagen  
Planet Laramie



We previously surveyed the farmers markets to see the number of producers that were using high tunnels at markets. There are over 40 producers who attend Wyoming farmers markets who have added a high tunnel to their growing options. These producers are providing the majority of early and late vegetables at rural markets that would not normally be grown locally. At the December Cheyenne winters market there were two vegetable vendors and both were utilizing high tunnels for their production. In addition there were 4 vendors selling value added specialty crops such as jams, jellies, pickles etc. of which one had a high tunnel. A vendor selling lamb products also had a high tunnel but had run out of produce earlier in the season.

## GOALS AND OUTCOMES ACHIEVED

**Goal1** – Increase specialty crop education, production, and consumption through season extension techniques, water conservation, and other projects that will extend or increase specialty crop production and consumption in Wyoming.

**Benchmark** – Number of grants awarded for season extension in the past is 28 and the number of people directly impacted by farm days and CSA's per grant averages 35.

**Target** – We expect the number of grants awarded for season extension techniques in this cycle to increase by 7 to 8 and the number of people directly impacted by farm days and CSAs to be 280. The number of individuals impacted at farmers markets is estimated to be double this amount.

**Performance Measure** – Wyoming Community Network managed the grant program and the WDA promoted it. On the final report and follow up interviews recipients reported on the number of people attending a field or farm day that learned about season extension techniques.

The grants awarded were:

**Chris's Greenhouse** Impact- 10 people have toured hoop house shared information with 9 local master gardeners, started a farmers market with 6 vendors

**Jan's Greenhouse** Impact-30 people toured the hoop house in 2014 with an additional 25 who participated in a u-pick program. Assisted summer class of 38 students on hoop house education and touring

**Good to Grow Farms** Impact- 58 people attended two gardening classes 80 people in CSA, 24 with work shares, and gardening classes for 27 4H kids

**Sheila Bird Farms** Impact- 27 people toured the hoop house and 40 CSA members increased their awareness of season extension by use of hoop house

**Patch Ranch** Impact-19 people have toured high tunnel

**Golden Rule Farm** Impact- 150 u-pick toured high tunnel, 10 4H judging team kids 25 third grade students farm tour, taught gardens class to 100 school students and hoop house growing class to 5 adults.

**Schierwagen Greenhouse** Impact-10 neighbors have toured the hoop house and shared information on season extension efforts with 12 master gardeners

**Planet Laramie** Impact-30 people Farm day

**Goal 2** – Increase amount of locally grown specialty crops available for sale at farmers markets and other direct marketing opportunities.

**Benchmark** – A survey of 2012 markets will determine a baseline.

**Target** – Through the utilization of season extension techniques, increase the amount of specialty crops available at farmers markets by at least 2%.

**Performance Measure**

We will monitor the progress toward this goal by surveying grant recipients to determine the value of specialty crop produced. Data will be analyzed as to the amount of locally grown specialty crops sold at market or by direct marketing by grant recipients.

Baseline information from the Agribusiness Division of the Wyoming Business Council for 2013 indicated that Wyoming Farmers' Markets generated nearly \$1.7 million of direct sales throughout Wyoming during 2012 with an economic impact of over \$2.2 million. A second study in 2014 found direct sales of Wyoming's 49 farmers markets increased to \$2.1 million a

23.5 percent increase. Based on a 2012 IMPLAN model for the state of Wyoming it is estimated that the \$2.1 million of direct sales generated secondary sales of more than \$654,000 for a total economic contribution to the Wyoming economy of nearly \$ 2.8 million.

### **BENEFICIARIES**

The beneficiaries included the 8 producers as well as the 8 farmers markets that they sold at. Produce was available in greater amounts and earlier and later into the market season. There were 638 additional students, neighbors, producers, master gardeners and CSA members who were impacted by the projects through an increase in awareness of season extension by high tunnel use.

### **LESSONS LEARNED**

Producers are not used to writing grants. Before a producer goes to the time and expense of submitting a grant we encouraged them to contact us for additional guidance. We recommend they review the sample grant application that was developed and encourage them to contact us if they additional questions. This year as in the past we received several calls from individuals who are not qualified under USDA rules to apply for the grant. They may have purchased acreage but have not used the land to produce any agricultural products as yet or are living in the city and want a high tunnel to help grow food for their family.

### **CONTACT INFORMATION**

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## WYOMING NONPROFIT ORGANIZATION HIGH TUNNEL, COMMUNITY GARDEN/FRUIT ORCHARD SMALL GRANT PROGRAM

### PROJECT SUMMARY

The Wyoming specialty crop program has offered small grants to nonprofit organizations to develop and promote methods that have extend or increased specialty crop production and consumption in Wyoming. The program has been instrumental in expanding the knowledge of producers, consumers and students. Since the inception of the program, grants have been awarded for promotion of specialty crops through construction of hoop houses/high tunnels for schools, communities, and other nonprofit organizations to provide production and educational opportunities in the climate challenged areas of Wyoming. In 2011 the small grant program was expanded to include community gardens. The results of the community gardens built in Wyoming have been an increase in knowledge, production, and consumption of specialty crops. Community gardens often incorporate hoop houses (high or low tunnels) to help conserve water, extend the growing season, and protect crops from hail, wind, and cold. The program has been instrumental in expanding the knowledge of producers, consumers and students. Recently, due to a specialty crop project on heritage apple propagation there has been expanded interest in re-establishing heritage fruit trees around the state. This initiative will include funding to these types of projects.

### PROJECT APPROACH

By providing small grants, no greater than \$3,500, to community nonprofits and schools the project increased specialty crop education, production, and consumption. This grant program was able to offer funds to non-profits and schools that created garden projects, fruit orchards or built a high tunnel to grow and promote specialty crop education, production and consumption. This small grant program enhanced other efforts being undertaken by the Wyoming specialty crop grants program. Application process included submitting an application, budget, and letter of support from a local entity that would vouch for an applicant's involvement in agriculture production. Applications were reviewed by WDA and WCN and successful applicants notified. Small grants were awarded to nonprofits organizations for the creation of garden, planting of fruit bush and tree garden/orchard and or hoop house season extension projects that help increase knowledge of specialty crop production. Grants were awarded on a competitive basis up to \$3,500 per applicant. We received and approved 9 grant applications. The applications were reviewed to determine that they met the requirements of the SCBGP. These grants typically impacted between 20-50 individuals associated with schools and nonprofits. They are not eligible to individual growers.

## HIGH TUNNEL, COMMUNITY GARDEN/FRUIT ORCHARD SMALL GRANT FOR NONPROFIT ORGANIZATIONS

### WYOMING SPECIALTY CROP GRANT PROGRAM

#### **Guidelines**

##### **PURPOSE**

Small grants will be awarded to nonprofit organizations and educational institutions to promote Specialty Crop season extension through community garden projects.

##### **Eligibility Requirements**

Wyoming nonprofit organizations are eligible to apply for a Wyoming Crop Specialty Program Community Garden Grant if they meet the following criteria:

1. **Be a registered Wyoming-based nonprofit organization or an educational institution in the State of Wyoming.**
2. Demonstrate that the organization is capable of promoting the use of specialty crop production through a community garden.
3. Have received a recommendation from a local agricultural entity that can vouch for their commitment to specialty crop agricultural production, promotion or education.

**Eligible expenditures** are limited to materials for raised beds, low tunnels, row covers, irrigation supplies, raised bed, soil amendments, mulch, garden tools, specialty crop seeds, starter plants/trees and other pre-approved costs necessary related to the project.

**In-kind matching expenditures** may include cash, donated labor, rental equipment and other approved expenditures directly related to the construction of the project.

**Ineligible grant expenditures include but are not limited to shipping, salaries and administrative costs.**

##### **AWARD LIMITATIONS**

**This is a matching program.** Nonprofit organizations may receive a maximum of one specialty crop grant up to August 1 2015. The total grant award is limited to 75% of the actual eligible expenditures. The minimum amount of a grant is \$500. The maximum a grant is \$3500.

##### **Requirements of the Organization Participant**

**Documentation:** The nonprofit organization must complete and submit to the Wyoming Department of Agriculture the following forms for reimbursement: 1) *Request for Reimbursement*, 2) *Itemized Expenditure* and, 3) a detailed hard copy and electronic copy of final report on the grant on or before September 28, 2015. Copies of canceled checks (both sides) or other confirmation of payment and invoices must be submitted for reimbursement.

**PLEASE NOTE:** Expenditures incurred without written or electronic confirmation from the Wyoming Department of Agriculture are not eligible for reimbursement. **The application process cannot be started after the nonprofit organization has purchased materials being requested in the grant for the community garden.**

##### **GENERAL GRANT INFORMATION**

The Wyoming Specialty Grant Program is a reimbursable grant; and as such, the applicant must pay all expenditures before the grant award can be disbursed. The organization shall function independently in performing this activity and shall assume sole responsibility of any debts or liabilities that may be incurred in regard to this grant. The grant award cannot be assigned.

***Return application forms to:***

Wyoming Department of Agriculture  
2219 Carey Ave.  
Cheyenne, WY 82002

**\*\*\*This program has a limited amount of funds. Money will be dispersed on a first come, first serve basis and the Wyoming Department of Agriculture reserves the right to deny applications that are not complete or otherwise deemed not eligible.\*\***

Application and guidelines were updated. Application and guidelines will be posted on the Wyoming Department of Agriculture web site (<http://wyagric.state.wy.us/>) and marketed through media releases, workshops and conferences. The following grants were reviewed for eligible expenses and impacts and were funded:

The following grants were approved:

**Fremont County Fairground** Hoop house project

**Niobrara County School District#1** Hoop house project

**Alta Elementary School** Hoop house project

**Boys and Girls Club of KC** Hoop house project

**Action Resources International** Laramie Hoop house project

**UWYO Hulett Orchard** Fruit trees

**Platte Co. Resource District** Classroom grow towers

**Hulett K-12 School** Hoop house project

**Boys & Girls Club of Cheyenne** Hoop house project

## **GOALS AND OUTCOMES ACHIEVED**

**Goal** – The goal of the project was to increase specialty crop education, production, and consumption through community/nonprofit garden, community orchard and/or high tunnel projects which will expand or extend the growing season of specialty crops grown in Wyoming.

**Benchmark** – Number of communities/schools that have received grants in the past is seventeen (16) directly impacting 25-65 people per project. Three community gardens that were previously funded impacted a total of 195 individuals.

**Target** –To increase the number of garden, orchard or high tunnel projects by 7- 8 and the number of people directly impacted between 175 and 520.

**Performance Measure** – The number of people who have increased their knowledge/awareness of specialty crop production by participating in community gardens/orchard development or hoop house construction were as follows:

**Fremont County Fairground Hoop house project:** Impact- 55 master gardeners, 530 4H students and over 1000 visitors to Fremont County Fair

**Niobrara County School District#1 Hoop house project:** Impact-145 middle school students 82 teachers and students help build the hoop houses

**Alta Elementary School Hoop house project:** Impact-51 students

**Boys and Girls Club of KC Hoop house project:** Impact-93 Boys and Girls Club Members

**Action Resources International Laramie Hoop house Project:** Impact- 400 people in 2014 who toured the hoop houses.

**UWYO Hulett Orchard:** Impact 157 students; orchard was planted as part of school farm

**Platte Co. Resource District Classroom Grow Towers:** Impact-218 students at Wheatland and Glendo schools

**Hulett K-12 School Hoop house project:** Impact-157 students

**Boys & Girls Club of Cheyenne Hoop house project:** Impact-300 Boys and Girls Club Members

## **BENEFICIARIES**

Beneficiaries included 1443 students, 55 master gardeners and 1400 consumers/home gardeners. The projects were varied between schools, nonprofit community organizations, county fairs and UWYO extension services.

## **LESSONS LEARNED**

Our biggest problem encountered other than lack of experience in constructing hoop houses occurred when the project manager at a school or nonprofit leaves in the middle of a project. This led to confusion as to who was going to take over responsibility for the project long term. We have been fortunate to date that other individuals within the organizations have stepped up to support the goals of the projects.

## **CONTACT INFORMATION**

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## ESTABLISHMENT OF MINTS AS HIGH-VALUE SPECIALTY CROPS FOR WYOMING

### PROJECT SUMMARY

The US is a major producer of peppermint and spearmint (NASS, 2011). For 2011, the values of peppermint and spearmint oils produced were \$128M and \$45M, respectively (NASS, 2011). Wyoming producers could tap into this lucrative and expanding market. This project built on field trials with mints conducted at Sheridan since 2011-2014 (see references and photos at the end of the proposal). The project was conducted in 2013 and in 2014 at two locations in Wyoming; Sheridan in Northern and Lingle in the Southeastern part of Wyoming. Overall, the four mint species grew well in both locations, and provided biomass and oil yields comparable to the reported yields from the traditional peppermint and spearmint growing areas in the United States. Oil content of the four species was also within the respective for the species oil concentration range reported in the literature. The chemical composition of the essential oil from the four mint species from this study is still being analyzed. We do not anticipate deviations in chemical composition of the essential oil from this study, as our previously published studies demonstrated that mints can be grown in Wyoming and could provide desirable oil content and composition.

### PROJECT APPROACH

Field trials were conducted in Lingle and Sheridan, Wyoming with four different mint species: peppermint, Scotch spearmint or gingermint (*Mentha gracilis* Sole.), Native spearmint (*Mentha spicata* L.), and Japanese cornmint (*Mentha canadensis* syn. *Mentha arvensis* L.). Plants were grown for two seasons, 2013 and 2014. All plants were harvested at flowering, when the content of the essential oil is the highest. Subsamples from the harvested biomass were extracted via steam distillation and the oil content was calculated as weight in g per 100 g of fresh biomass. Once the chemical analyses of the essential oil are accomplished, all the data will be being analyzed and compiled into manuscripts for refereed journal publications.

### GOALS AND OUTCOMES ACHIEVED

Project Purpose/Goals: The long term goals are to establish mint as a new crop and develop a sustainable mint essential oil production industry in Wyoming. Specific objectives for this 2-year study (2013 and 2014 cropping seasons) were:

- (1) Evaluate productivity and oil quality of mint oils produced in Wyoming.
- (2) Study on optimizing nitrogen (N) fertilization for the four mints in Wyoming.
- (3) Demonstration of the new crops and practices growers and also to students at Sheridan College, University of Wyoming.

Activities performed:

- The project was initiated and conducted at two sites: Lingle and in Sheridan, WY.
- Planting material for the 4 mints was produced in a greenhouse in Sheridan by the project participants to make sure all transplants were equally developed. These were then transplanted at the project sites.
- The 4 mints at both locations were transplanted in the late summer of 2013 at the same day to avoid any differences due to transplanting time

The work plan (as indicated in the original proposal) is outlined below

**Goal 2: Study on optimizing nitrogen (N) fertilization for the four mints for the ecological conditions of Wyoming.** Four field experiments (one for each mint species) were established to meet this objective. Experiments were run for two cropping seasons (2013 and 2014).

The N fertilizer application rates were based on the current recommendation in Oregon and Washington. It is well known that peppermint growers in Oregon and Washington states use higher than recommended N rates, while no information is available for Wyoming. Hence, more work needed to be done for the development of sustainable mint production systems in Wyoming.

- For this part, a previously established plantation (in 2011) of peppermint, spearmint, and Japanese mint were used.
- Nitrogen fertilizers were added in the spring of 2013 and again in the spring of 2014. In both cropping seasons, the mints were harvested when they reached flowering. In 2013, we harvested first the spearmints in the first week of July, then peppermint on Aug 5-6, and then Japanese cornmint on Aug 12. The Scotch spearmint was able to provide a second cut on Sept 24<sup>th</sup>.
- During the 2014 cropping season, the spearmint was harvested on July 28 and 29<sup>th</sup>, peppermint on August 6 and 7<sup>th</sup>, and Japanese cornmint on Aug 9 and 10<sup>th</sup>.
- During the 2014 cropping season, the mint plots in Lingle were harvested as follows: Scotch and Native spearmints were harvested on July 31<sup>st</sup>, and peppermint and Japanese cornmint were harvested on August 21<sup>st</sup>.
- All mints provided good herbage yields (comparable to the ones reported in the literature). The Scotch spearmint did not provide a second cut in 2014.
- Representative samples from all plots were extracted for essential oil. The essential oil content and oil yields were very good, comparable or higher than the one reported in the literature for the respective mints. The oil samples were sent to Dr. Charles Cantrell for analyses.

**Objective 3: Demonstration of the new crops and practices to potential growers.**

The objective was met by demonstrating the mint trials at Sheridan Field Day in 2013. The Field Day in 2014 at Sheridan was rainy and for that reason the field tour was canceled. However, the plots at Sheridan and at Lingle were available for individual growers and groups to visit. The project participants also made themselves available for questions and consultations to growers,

faculty, and students. Some of the project photos and data are being incorporated in teaching materials and courses.

The objective was met by organizing two field days, of which one was very successful.

- The N fertilization part of the project was presented at the Sheridan Research and Extension Center Field day in 2013. Around 100 people (including producers, homeowners, and UW extension personnel) attended this Field Day. Survey was not conducted at the field day however, Dr. Jeliaskov conducted a separate survey by mailing questionnaire to several hundred growers in Wyoming. Results indicated significant interest in Medicinal and Aromatic Plants.
- During the 2014 Field Day at Sheridan, due to the heavy rain, only 25 participants were present, and were notified about the ongoing project with mints. We could not make an onsite presentation. No survey was conducted at this event. See above.
- Reflections magazine article entitled “Mint Research in Wyoming Smells Sweet” was published and is available online:  
<http://www.uwyo.edu/uwexpstn/publications/reflections/reflections-2014-web.pdf>
- Also, individual producers and homeowners visited the project site at other times with V. Jeliaskov.
- In addition, information and photos from the project were used in the UW Online Course AECL/PLNT 4190/5190 Herbs, Spices and Medicinal Plants offered during the fall 2013 by Dr. V. Jeliaskov. More than 30 students were taking the above hybrid class.
- The students in the above class were given an opportunity to fill a questionnaire/survey on Specialty Crops Priorities in Wyoming; most students indicated their interest in more research on mints in Wyoming.

Establishing of mint as a new crop and develop a sustainable mint essential oil production industry in Wyoming is a long-term goal. This project demonstrated the feasibility of mint growing in Wyoming, and generated significant amount of knowledge and interest towards mints. However, getting into commercial mint production is a long process; potential growers would need significant investment in extraction facilities, specialized machinery, propagation material, and also access to markets, which can be provided by essential oil dealers.

Additionally, we conducted a survey on specialty crops in Wyoming. In total, we had 68 respondents. Of these, 14 were interested in getting more information on essential oil crops such as peppermint, chamomile, coriander, 24 expressed interest in medicinal plants, and 20 in culinary herbs. This survey demonstrated interest in mints and other essential oil crops, including mints as culinary herbs. More research would need to be conducted on the economic feasibility for growing mints in Wyoming; we provided the agronomy aspect.

## **BENEFICIARIES**

The beneficiaries of this project are:

- Existing and potential specialty crops growers in Wyoming and in other regions with similar climate, such as Montana
- Small farm owners who may be interested in entering the specialty crop business
- Faculty and students at the University of Wyoming and Sheridan College. Some were involved in the project, others were taking tours, and yet others were exposed to some of the results of this project through the UW course Herbs Spices and Medicinal Plants
- Researchers, students, and general public throughout the world through exposure to the upcoming publications

## LESSONS LEARNED

The mint plantation established in Sheridan was at the newly acquired Adams Ranch by the UW. We had significant wildlife damage on mints at Adams Ranch although we placed 4 electronic deterrent systems at the four corners of the trial. There are around 100+ head herd of pronghorn antelope, more or less permanently at Adam Ranch. In addition, deer pressure is significant. Adams Ranch is in close proximity to residential and school area, which makes control of the wild angular difficult. In the spring of 2014, we evaluated the mints at Adams Ranch and made a decision to abandon them because very few plants survived after the wildlife intensive grazing. Hence, we continued with the research at Sheridan College (fenced 2 acre area) and at Lingle, where the wildlife pressure is negligible to non-existing. However, we did not have any damage from wildlife at the Lingle locations. Therefore, fencing of mints should be considered in areas with significant wildlife presence.

- Weed control in peppermint, spearmint and Japanese mint could be problematic due to the relatively few herbicides registered for weed control in these crops and the slow growth rate of mints that could be easily over competed by rigorously grown weeds. Therefore, potential growers need to consider establishing of new plantations in relatively weed-free fields and to expect that some hand weeding may be necessary.
- Peppermint, spearmints, and Japanese mints are known to be infested by various pests and diseases. However, we did not encounter any disease or insect pressure, most probably due to (1) the dry Wyoming climate (2) utilization of drip tape irrigation instead of sprinkler, (3) utilization of virus-free and disease-free planting material, (4) significant distance to other mint growing areas. Potential growers should be aware of the typical diseases and insects on peppermint and spearmints in the United States and take necessary control measures. Utilization of virus and disease-free planting material is encouraged, although it may be more expensive.
- Peppermint, spearmint, and Japanese mint could be developed as new specialty high-value crops for Wyoming and other regions with similar climate

## CONTACT INFORMATION

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### Publications on studies on mints in Wyoming

Buffalo, J., V.D. **Zheljaskov**, C.L. Cantrell, T. Astatkie, L. Ciampa, and E.A. Jeliaskova. 2015.

Diurnal effects on spearmint oil yields and composition. *Scientia Horticulturae*. 182:73-76.

Burkhardt, A., A. Gawde, C.L. Cantrell, H.L. Baxter, B.L. Joyce, C. Neal Stewart Jr., and V.D.

**Zheljaskov\***. 2015. Effects of produced water on soil characteristics, plant biomass, and secondary metabolites. *J. Environ. Qual.* 44:1938–1947. doi:10.2134/jeq2015.06.0299

Shiwakoti, S., H.Y. Sintim, S. Poudyal, J. Bufalo, C.L. Cantrell, T. Astatkie, E. Jeliaskova, L. Ciampa,

V.D. **Zheljaskov**. 2015. Diurnal effects on *Mentha canadensis* oil concentration and composition at two different harvests. *HortScience* 50 (1): 85-89.

**Zheljaskov**, V.D., T. Astatkie, and E.A. Jeliaskova. 2014. Drying and shade effects on spearmint oil yields and composition. *HortScience*. 49(3):306–310.

**Zheljaskov**, V.D., C.L. Cantrell, T. Astatkie, and E. Jeliaskova. 2013. *Mentha canadensis* L., a subtropical plant, can withstand first few fall frosts when grown in northern climate. *Industrial Crops and Products*. 49:521-525.

<http://dx.doi.org.libproxy.uwyo.edu/10.1016/j.indcrop.2013.05.034>

**Zheljaskov**, V.D., T. Astatkie, and E. Jeliaskova. 2013. Effect of foliar application of methyl jasmonate and extracts of juniper and sagebrush on essential oil yield and composition of 'Native' spearmint. *HortScience*. 48(4): 462-465.

**Zheljaskov**, V.D., C.L. Cantrell, T. Astatkie, and E. Jeliaskova. 2012. Fall frosts effects on the essential oil of "Native" spearmint in Wyoming. *HortScience* 47(11):1603-1606.

**Below are trials with peppermint, spearmint, and Japanese mints at Sheridan, WY.**



Steam distillation (left) of mint from container experiments at ShREC (Sheridan Research and Extension Center). Solvent-free microwave extraction lab station (right) at ShREC.



## **AGRONOMIC AND ECONOMIC EVALUATION OF ORGANIC AND CONVENTIONAL SOIL FERTILITY MANAGEMENT IN HIGH TUNNELS**

### **PROJECT SUMMARY**

There was increasing interest in the use of high tunnels for season extension and production of high value locally grown vegetables in Wyoming. Nutrients requirements for vegetables produced under high tunnels tended to be greater due to relatively higher yields compared to field grown vegetables. Sustainable nutrient management was critical in high tunnel production systems. The objectives of the study were to: (i) determine effectiveness of selected certified organic nutrient sources in comparison to inorganic fertilizer (conventional) on growth and yield of selected vegetables; (ii) assess the impact of the organic nutrient sources on soil quality; (iii) compare the economic viability of selected organic materials to inorganic fertilizer based on their effect on vegetable yield and soil nutrient availability, and (v) educate, train, and demonstrate to growers the advantages of using high tunnels for both organic and inorganic vegetable production through field days and workshops. The experiment was conducted in a high tunnel at the James C. Hageman Sustainable Agriculture Research and Extension Center (SAREC) near Lingle, Wyoming. Fertilizer treatments included organic (fishmeal, veggie mix, and seabird guano), inorganic (commercial; NPK), and control. The experiment was laid out as a randomized complete block design with three replicates. Pepper, tomato, carrots, spinach, and radish were used as test crops. Vegetable yield and fruit yield per plant, especially for carrot and tomato, were significant in high tunnel. There was no difference among fertilizer treatments for total fruit yields of both pepper and tomato however, an increasing trend of yield was observed in organic seed beds compared to control. This suggested that in the longer term, organic fertilizers would be more beneficial and advantageous in terms of soil health and economic returns. It was anticipated that the growth, yield, and total production of high value crops can be increased in areas of shorter growing season using organic high tunnel production systems

### **PROJECT APPROACH**

The experiment was conducted in a high tunnel at SAREC near Lingle, Wyoming. Fertilizer treatments included organic (fishmeal, veggie mix, and seabird guano), inorganic (commercial; NPK), and control. The experiment was laid out as a randomized complete block design with three replicates. All organic fertilizer materials were purchased from local certified dealers. The amount of material applied per treatment was calculated based on the total N concentration of the material used after adjusting for N availability over the growing season.

In 2013, 18 raised seedbeds were installed with local soil mixtures as growth media. Drip irrigation system with timer was also installed to each seedbed to supply water as needed basis.



Temperature was recorded regularly with the installed thermometer in the high tunnel. Initial soil test showed high and variable N concentrations in the soil mixture media, so no fertilizer treatment was applied in the initial study with the aim to utilize all nutrients, especially N, in the soil mixtures. Two vegetable species (pepper and tomato) and two varieties from each of the species were used in the study. Varieties included 'California Wonder' and 'Keystone Giant' for pepper and 'Betterboy' and 'Bushmaster' for tomato. Two plants per variety were transplanted into the seedbeds on May 9, 2013. Vegetative growth, number of fruits, and fruit quality as shape and size were monitored throughout the growing season. Fruit harvesting started in July, 2013 with 2-6 harvests per month and continued until October, 2013. Total yield was calculated by summing all monthly harvest yields during the growing season. In 2014, pepper (Keystone Giant and 'Socraties X3R Hybrid') and tomato (Betterboy and 'Trust') were planted on May 9, 2014. Fruit harvesting started in July, 2014 with two to four harvests per month and continued until October, 2014. In addition to tomato and pepper, in the spring of 2014, radish, spinach, and carrot were planted into the beds on March 20, 2014. Harvesting of radish started on April 28 and completed on May 28. As soon as the spinach harvest was completed, soil samples from the seedbeds were collected for nutrient analysis and applying nutrient treatments. The seedbeds were tilled and organic treatments were incorporated into the soils to improve the soil structure. In 2015, similar approach to 2013 and 2014 was undertaken. Only difference was to incorporate organic (fishmeal, veggie mix, seabird guano) and inorganic (commercial) fertilizers in the raised seed bed based on soil test results. Each type of fertilizer was added to bring the bed soil to 150 pounds N per acre. The control was left at 80 pounds N per acre. The varieties used for pepper were 'Early Summer' and Socraties X3R Hybrid and that of tomato were 'Chefs Choice' and Trust.

## GOALS AND OUTCOMES

**Goal:** The goal of the project was to develop sustainable nutrient management strategies for optimal high tunnel vegetable production by comparing agronomic and economic benefits of organic and inorganic soil fertility management in high tunnels.

**Outcome:** In 2013, results showed that there was no effect of seedbed ( $P=0.8589$ ), plant ( $P=0.1943$ ), variety ( $P=0.7858$ ), and species  $\times$  variety interaction ( $P=0.1275$ ) on total fruit yield per plant. However, as expected, there was highly significant effect ( $P<0.0001$ ) of species on total fruit yields. Average fruit yield of pepper was 4.6 pounds per plant (4.1 pounds per plant for California Wonder; 5.2 pounds per plant for Keystone Giant) while the average fruit yield of tomato was 21 pounds per plant (22.0 pounds per plant for Betterboy; 20.4 pounds per plant for Bushmaster) (Table 1). Fruit yield per plant, especially for tomato, was highly significant.



In 2014, to utilize the nutrients and N in the raised seedbeds during the winter and spring, spinach and radish were planted in the fall (2013). Radish did not survive but the spinach survived during the winter and they grew well in the spring (2014). On March 13, 2014, the harvest of spinach yielded 2.7 pounds (total).

Average fruit yield of pepper was 2.2 pounds per plant (1.9 pounds per plant for Keystone Giant; 2.5 pounds per plant for Socraties X3R Hybrid) while the average fruit yield of tomato was 19.9 pounds per plant (20.2 pounds per plant for Betterboy; 19.8 pounds per plant for Trust) (Table 1).

A total of 72 radishes per square meter (or 10 square feet) were harvested at a weight of 2.0 pounds per square meter (Table 2; Figure 1). The spinach was harvested once per week starting May 1 for five weeks. Total yield of spinach was 3.7 pounds per square meter. The carrots were harvested over a period of three weeks. The first harvest was on June 24 with a total yield of 2.4 pounds per square meter. A week later on June 30, carrot yield was 3.3 pounds per square meter. The last carrot harvest on July 8 yielded 6.8 pounds per square meter. The total yield of carrots from three harvests was 12.6 pounds per square meter.

In 2015, similar to previous years, there was no effect of seedbed, plant, variety, fertilizer, species  $\times$  variety interaction, and species  $\times$  variety  $\times$  fertilizer interaction on total fruit yield per plant. However, there was highly significant effect ( $P < 0.0001$ ) of species on total fruit yields. Average fruit yield for pepper was 3.5 pounds per plant (3.4 pounds per plant for Early Summer; 3.6 pounds per plant for Socraties X3R Hybrid) while the average fruit yield for tomato was 10.4 pounds per plant (10.9 pounds per plant for Chefs Choice; 9.9 pounds per plant for Trust) (Table 1). Although there was no difference among fertilizers for total fruit yields of pepper (ranged 2.8-4.0 pounds per plant) and tomato (ranged 6.9-12.1 pounds per plant), an increasing trend of yield was observed in organic seedbeds compared to control (Table 3). This clearly indicates that in the longer term, organic fertilizers would be more beneficial and advantageous in terms of soil health and economic returns.

**Table 1. Fruit yield in high tunnel, SAREC (pounds per plant)**

Species/Year	2013	2014	2015	Average of three years
Pepper	4.6 b*	2.2 b	3.5 b	3.4 b
Tomato	21.0 a	19.9 a	10.4 a	17.1 a

\*Different letters followed by mean values within each column differ significantly ( $P < 0.05$ ).

**Table 2. Vegetable yield in high tunnel, SAREC April-July, 2014**

Vegetables	Duration	Yield (pound per sq. meter)
Radish	Apr 28-May 28	2.0 c*
Spinach	May 1-Jun 5	3.7 b
Carrots	Jun 24-Jul 8	12.6 a

\*Different letters followed by mean values within the column differ significantly ( $P<0.05$ ).

**Table 3. Fruit yield of pepper and tomato as affected by organic and inorganic fertilizers in high tunnel, SAREC**

Fertilizers	Tomato	
	<i>Variety: Chefs choice</i>	<i>Variety: Trust</i>
Control	9.1 (1.2)	6.9 (1.2)
Commercial (NPK)	11.9 (0.8)	9.9 (0.8)
Fishmeal	12.1 (1.2)	11.42 (1.2)
Seabird guano	11.3 (1.2)	11.4 (1.2)
Veggie	10.3 (1.2)	10.1 (1.2)
	Pepper	
	<i>Variety: Early Summer</i>	<i>Variety: Socraties X3R Hybrid</i>
Control	2.8 (1.2)	3.0 (1.2)
Commercial (NPK)	2.9 (0.8)	3.2 (0.8)
Fishmeal	3.3 (1.2)	3.8 (1.2)
Seabird guano	3.9 (1.2)	3.7 (1.2)
Veggie	4.0 (1.2)	4.0 (1.2)



**Figure 1. Some pictures showing fruits and vegetables grown in the high tunnel at SAREC, Lingle.**

Organic fertilizers produced the same vegetable and fruit yields as with commercial fertilizer indicating their potential to improve soil health and sustainable production in longer term. Additionally, the results were very useful for developing future studies such as organic amendments and nitrogen mineralization, nitrogen rates and specialty fertilizer, irrigation and fertigation, high value crop variety trials, and pest (e.g., aphids and grasshoppers) management. The results obtained from this high tunnel study were disseminated in many ways, especially through Field Days, Demonstrations, and One-on-One consultations. Starting from 2013, we had three Field Days at SAREC, Lingle. One of the busiest station stops for research demonstration was SAREC high tunnel organic research project. The number of people who attended the field days ranged from 100-160 per year. Because of its proximity to the main building almost 100% of the attendees visited the high tunnel before attending any other demonstration stations. When field day attendees were asked individually about high tunnel vegetable production, especially organic versus inorganic production systems in high tunnels, almost 100% answered “I don’t know.” After viewing the demonstration and discussions, when asked about their current interest and knowledge on organic high tunnel vegetable production, their answers were very positive and they showed interest for more information and future high tunnel visits. By the third year (2015) people were much more aware of high tunnel organic vegetable production and indicated interest in organic high tunnel vegetable production. From this pre- and post-observations and one-on-one consultations, it was clear that growers’ knowledge on the potential for organic high tunnel production had increased from zero to about 100%. Approximately 300 people/extension professionals/growers have benefited, and improved their knowledge on organic high tunnel production during the study period. As an added benefit results on pest management practices used for this study were also presented to participants of the integrated pest management portion of six Master Gardener’s trainings. These six seminars provided information to 48 master gardeners and increased their knowledge an average of 28% on organic bio-control, mechanical control, and cultural control of pests in high tunnel production.

## **BENEFICIARIES**

Project benefits and beneficiaries are varied. Producers, extension educators, students, stakeholders, and scientists have received benefits from the results of the study. Study results have been demonstrated in the UW-SAREC Field Days, high tunnel vegetable production workshops, scientific meetings (nationally and internationally; Islam et al., 2015), and classroom teaching at the University of Wyoming. As described above, at least 300 growers/producers from three SAREC Field Days came into close contact with the high tunnel project and improved their current knowledge on organic high tunnel production system. Over 100 high tunnels have been built in Wyoming since 2008 through the specialty crop program. These high tunnel growers are beneficiaries of this study. Results from this study also benefited 48 Master

Gardeners statewide. The results of the study will also be distributed through future events such as during a specialty crop seminar at the upcoming Wyoming Farmers Marketing Association Conference to be held in March 2016. Attendance at this conference is expected to be 125-150 producers and master gardeners. This study was invaluable for trainings, and demonstrations that benefit farmers and extension educators on sustainable nutrient management strategies to improve yields and vegetable quality in the high tunnel organic vegetable production systems. Wyoming specialty crop producers, especially organic growers, needed organic production research to help generate more farm income in extended growing season systems. This high tunnel vegetable production research showed promise not only through high yield and quality but also by showing the additional revenue potential of organic production during times when no crops could survive in field conditions.

**Publication:**

Islam, M.A., Nachtman, J., Obour, A.K., and Edwards, J. 2015. Agronomic Performance of High Value Crops in High Tunnel in Wyoming, USA. Proceedings of the International Conference on Agronomy and Horticulture, August 25-27, 2015, Shanghai, China. ICAH 2015, Shanghai, China.

## LESSONS LEARNED

Overall, vegetable yield and fruit yield per plant, especially for carrots, peppers and tomatoes, were significantly higher and there were no significant differences between organic and inorganic fertilizer treatments for total yields in the high tunnel. The growth, yield, and total production of high value crops be they organic or conventional can be increased in areas of shorter growing season using high tunnel production systems.

## CONTACT

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## INTEGRATED PRODUCTION OF MUSHROOMS AND NUT TREES SUITABLE FOR WYOMING GROWING CONDITIONS

### PROJECT SUMMARY

Specialty crop producers often produce high value crops in relatively small scale. This project explored the feasibility of mushroom production in existing production systems. The idea was that without increasing space, another crop (mushrooms) could be introduced to a production system and increase profits from a finite space. Additionally, indoor mushroom production explored growth and production in a controlled environment and has potential for year-round production. This project researched how to grow two specialty crops (nut trees and edible mushrooms) together, separately or in mixtures with other crops at high elevation short season climate of the Laramie Valley, Wyoming. The specific location of the project was the University of Wyoming ACRES (Agricultural Community Resources for Everyday Sustainability) student farm. An add-on component of this project also included a novel design of a portable hydroponic growing system (Indoor Grow Unit) utilized for the purpose of growing mushrooms in winter and for outreach demonstrations. Large emphasis of this project was put into extension and classroom education as workshops, presentations, classroom teaching and producer networking that involved Master Gardener Program and UW Extension activities.

Specific goals of this project included:

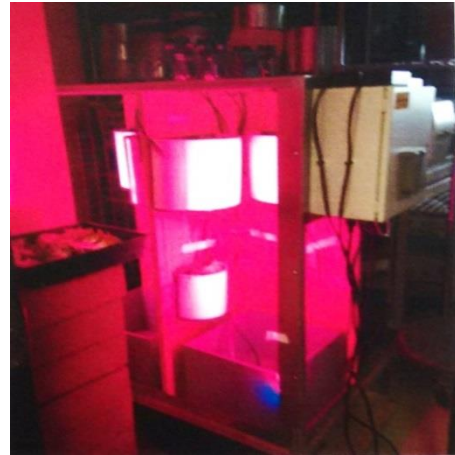
1. Testing the adaptability of cold hardy and disease and pest-resistant hazelnuts and chestnuts
2. Assessing the effectiveness of the establishment of four kinds of mushrooms in the presence of host plants (nut trees and vegetables)
3. Designing a season-extension production unit for growing mushrooms and mushrooms in conjunction with annual vegetables.
4. Carrying out educational workshops, classroom hands-on practicum and development of the internet networking interphase that would assist local producers in starting their own production.

These objectives addressed novel approaches to growing highly desirable specialty crops and created a better understanding of the production in challenging environment. To our knowledge the idea of growing mushrooms and nuts in Wyoming had not been fully tested before, yet now there was an increasing number of mushroom producers. Moreover students became interested in learning about the process and local gardeners have become interested in growing hazelnuts.

### PROJECT APPROACH

A series of plantings to establish perennial nut tree and mushroom production at the ACRES farm (inside hoop houses, the shed, outside vegetable beds and a windbreak) was carried out

every year. In addition, a series of indoor mushroom producing settings were established in lab facilities in the University of Wyoming Agriculture Bldg that served education, outreach and experimental purposes. An Indoor Grow Unit was constructed and planted with mushrooms. This unit has been used for the extension outreach activities and class demonstrations. A series of mushroom growing workshops (three), short movies, popular science articles, student intern oral/poster presentations and the end of the growing season farm reports were produced.



## GOALS AND OUTCOMES ACHIEVED

**MAIN GOAL:** Increase grower understanding of strategies and available materials to intercrop tree nuts and mushrooms for dual production benefit.

September 2013 – ACRES Open Gate, Outdoor Mushroom Production Demonstration, Growing Mushrooms in Logs, Growing Mushrooms in Straw, Growing Mushrooms in Vegetables, Growing Mushrooms in Mulch, 100 plus attendees

April 2014 – Outdoor Mushroom Production Workshop, Growing Mushrooms in Logs, Growing Mushrooms in Straw, Growing Mushrooms in Vegetables, Growing Mushrooms in Mulch, 35 attendees

September 2015 – ACRES Open Gate, Outdoor Mushroom Production Demonstration, Growing Mushrooms in Logs, Growing Mushrooms in Straw, Growing Mushrooms in Vegetables, Growing Mushrooms in Mulch, 120 attendees

March 2015 – The Art of Raising Mushrooms, 1 hour presentation, 28 attendees

October 2015 – Specialty Crop Workshop, How to Grow Mushrooms, 1 hour presentation, 22 attendees

**BENCHMARK:** There was no benchmark data currently but data was gathered using surveys and pre and posttests at the workshops and conferences

Pre and post evaluations indicated an increase in knowledge of growing mushrooms (2.25 pre, 4.0 post on a scale of 1-5) and an increase in knowledge of mushroom species that can be grown in Wyoming (2.08 pre, 3.92 post).

**TARGET:** An increase in 15% between pre and post test scores would reveal and increase and an indication by 20% of participants who planned on implementing techniques learned.

Pre and post tests show 53% increase in knowledge of growing mushrooms, 59% increase in knowledge of growing mushrooms in Laramie, 15% gain in interest in growing mushrooms, and 100% indicated they would try growing mushrooms using techniques learned from the workshop.



**PERFORMANCE MEASURE:** Increase in number of workshop and conference participants indicating plans to implement what they learned and increase in numbers of inquiries received by Master Gardener Coordinator.

Evaluations indicated 4 participants had grown mushrooms before attending our workshop. 12 indicated they intend to grow mushrooms (300% increase) after attending our workshop.

Master Gardener coordinator received 7 inquiries regarding mushroom production indoors and outdoors.

**Survey findings:**

- Participants generally had good knowledge of the importance of mushrooms to human and plant health prior to the workshop. They gained little knowledge during the workshop.
- Participants gained significant knowledge of mushroom species that can be grown in Laramie.
- Participants gained significant general knowledge of how to grow mushrooms.
- Participants gained significant knowledge of techniques used to grow mushrooms in Laramie.
- Participants did not indicate they learned how to identify wild or edible mushrooms.
- Participants indicated an increased interest in growing mushrooms at home.
- All participants indicated they would try growing mushrooms at home.
- Overall, the workshop received high ratings – 4.3 average
- Half of the participants think we should offer another workshop, half think we should not.
- All participants found value in the workshop.

All four objectives proposed in the original proposal were completed. A series of mushroom plantings occurred throughout the duration of the experiment. Each year an improved method of planting was developed that resulted in a successful crop and harvest of four kinds of mushrooms. The vegetable beds and nut tree groves were inoculated with the mushroom strains that should last two to three more years and continue fruiting.

**Objective 1:** Tested the adaptability of cold hardy and disease and pest-resistant hazelnuts/chestnuts.

Nut tree production shifted toward the efforts of producing hazelnuts. This was driven by the fact that a lot of tree nursery owners were unable to provide a cold-hardy and drought resistant variety of chestnuts. Instead, two separate plantings of hazelnuts took place with trees sourced from three different plant nurseries. Over 90% of the trees survived the first winter and grew over the season. To integrate current farm operation with tree nut production, shrubs were planted along the North and West facing fence. Plants were monitored for annual growth and possible signs of stress. There was plenty of room to grow in these areas and newly established growth was furnished with drip irrigation using well water and water collected from a rain barrel. Water collected in two rain barrels was then delivered to the trees using a soaker hose.

In case of limited rainfall, gravity irrigation flow was supplemented by well water delivered to the rain barrels.

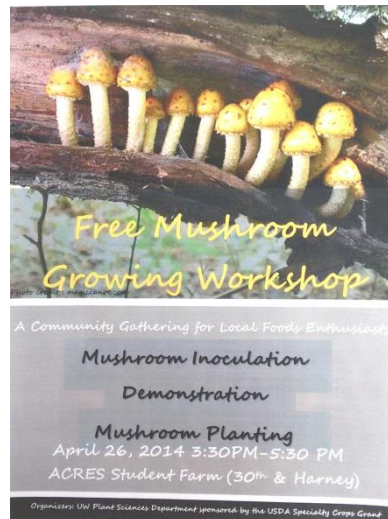
**Objective 2:** Assessed the effectiveness of the establishment of four kinds of mushrooms in the presence of host plants (nut trees and vegetables)

Four different kinds of mushroom producing fungi were established on farm in a series of experiments. These included: (1) hazelnut tree inoculation using hardwood mulch as a fungal substrate twice in a year, in summer and fall; (2) tomato and peppers inoculation using straw as a fungal substrate for hoop house production; (3) cabbage, broccoli, zucchini inoculation using straw and hardwood mulch as a fungal substrate for outside bed production established in summer; (4) cottonwood stump inoculation for outside and inside hoop house production; (5) in-bag mushroom production in a shed during summer and indoors during winter. Mushroom appearance and crop yields were monitored throughout the season. Mushrooms are slow to grow in this climate but the presence of extensive hyphae penetrating the mulch was observed especially in the outside bed production and in the stumps. Appropriate level of watering and monitoring inside hoop house temperature to prevent over heating were critical components of the successful mushroom production. In addition, determining the right thickness of mulch for both, outside and inside production was critical. Large part of the success in the last growing season was due to the additional mentoring provided by several people who learned how to grow mushrooms by attending one of our workshops and who now produce them commercially. Their assistance in producing locally sourced and tested mushroom started made a significant difference in the overall production.

**Objective 3:** Designed a season-extension production unit for growing mushrooms and mushrooms in conjunction with annual vegetables.

Indoor Grow Unit – a portable grow station equipped with controlled high efficiency grow lights and hydroponic irrigation was built based on joint PI Lisa Aston-Philander and UW engineers design and completed at the UW Machine Shop in spring 2015. Mushroom growing operation was established starting in late summer. PI Chris Hilgert was mentored through the process of learning how to inoculate grain to produce spawn and how to plant spawn of three different kinds of mushrooms in different substrates. Mushrooms continued to fruit and there are plans to utilize this unit for Master Gardener training.

**Objective 4:** Carried out multiple educational workshops, classroom hands-on practicum and development of the internet networking interphase that would assist local producers in starting their own production.





**Additional outreach measures:**

A series of educational and outreach materials were developed by Master Gardener Coordinator. These included three short e-Extension "From the Ground Up" YouTube videos and a popular science article Barnyards and Backyards Winter 2015 issue. Parts of the movies were featured in the Casper News channel 13 in spring 2015. Materials distributed during the workshop, popular science articles and student presentations acknowledged the source of this funding.

From the Ground Up videos and amount of on-line views:

Growing Mushrooms in Wyoming -149 views

[https://www.youtube.com/watch?v=cSA\\_clMT6X4&index=16&list=PL1964BF0FA26DF728](https://www.youtube.com/watch?v=cSA_clMT6X4&index=16&list=PL1964BF0FA26DF728)

Inoculating Logs- 906 views

<https://www.youtube.com/watch?v=XvmpalE7q38&index=15&list=PL1964BF0FA26DF728>

Growing Mushrooms in Straw and Mulch- 1,508 views

[https://www.youtube.com/watch?v=rD\\_UzsRLBxQ&index=14&list=PL1964BF0FA26DF728](https://www.youtube.com/watch?v=rD_UzsRLBxQ&index=14&list=PL1964BF0FA26DF728)

In fall of 2014 and 2015, Wyoming Agricultural Experiment Station Field Days offered a tour of the ACRES farm that involved presentation on hazelnut and mushroom production.

In fall 2014 and 2015, Agroecology 1000 class attended by 53 students each year visited the farm and had an opportunity to have hands-on experience learning about the project.

One full time Agroecology major intern assisted in hazelnut and mushroom production during summers of 2014 and 2015 growing season.

A small NSF funded grant was secured by one of the ACRES students to determine the impact of mushroom inoculated substrate in phosphorous availability for tomatoes. The conclusion derived from this one season project was that tomatoes grown in straw with mushrooms do as well as tomatoes fertilized with mineral or compost derived P.

Science module for 8th and 9th graders was developed. Ms. McLaughlin and Ms. Markley from the UW Lab Middle School visited ACRES farm in fall 2015.

PI Chris Hilgert, Master Gardener Coordinator is planning to develop a Master Gardener Training module to include in the future training.

PI Chris Hilgert published a paper on mushroom production in Barnyard and Backyard Winter 2015 issue available online and in paper copies mailed out state-wide.

PI Norton contacted Microbiology department and helped develop a teaching module for Microbiology Senior level capstone seminar to design best management strategies for successful mushroom production on a variety of substrates sourced from local compost supplies. Senior students presented the poster with their findings on December 11<sup>th</sup>. Electronic copy of the poster will be available upon request.

## **BENEFICIARIES**

This project benefitted local people in Laramie and the state of WY interested in learning how to grow mushrooms, UW students, middle school students and teachers, local gardeners and others who participated in workshops, demonstration events, Ag Experiment Station Field Days and seminars. In total, 305 people attended mushroom production workshops and 2563 people have viewed online mushroom production videos produced by PI Hilgert. One business was started (Planet Laramie Mushrooms) following our workshop. Additional inquiries were received from Wyoming residents and one business in Fort Collins, Colorado (Green Dog Farm) after viewing online resources.

## **LESSONS LEARNED**

As anticipated, mushroom fruiting may take longer in this climate compared with other more production-conducive areas. Early indices of mushroom production were observed in the outside beds covered with straw and on the stumps. Water is the main limiting factor so appropriate level of attention needs to be secured. This was important not only to help mushrooms but also vegetables planted with. We learned that sufficient watering to support successful establishment of the mushroom mycelium is more critical at the early stage of the production (mid to late summer). Reducing the water later in the season will trigger mushroom fruiting and more successful crop. Making sure hoop houses do not overheat was also a critical aspect of mushroom production. We also observed that mushrooms were more abundant in areas that were well vegetated and provided sufficient shading, such as beneath zucchini leaves, close to tomatoes stems or between the weeds.

Adding hardwood mulch may ultimately pose a problem which we yet to confirm. This was observed as localized plant deficiencies in some areas of the farm. Hardwood mulch is a carbon rich substrate that can induce nitrogen and nutrient fixation making them unavailable to plants. Using straw may be a better alternative as it can reduce the physical barrier and allow mushrooms to emerge.

The first year of hazelnut establishment required a large amount of labor. Once established, trees grew well and survived the winter. We observed that hazelnut trees grown in close vicinity with sunflowers performed much better than away from them. This may be due to the possible shading in the middle of the day provided by much taller sunflowers. Competition for water did not appear to be an issue.

Large part of the success of starting your own mushroom spawn lies within making sure the mushroom cultures are not contaminated by other fungi that may damage the growth. Water source may also be a possible source of contamination.

## CONTACT INFORMATION

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## Additional Survey Information

Workshop participant survey summary

Workshop Survey's completed

How important are mushrooms human health and plant health? Pre 3.92- Post 4.33

Rate your knowledge of mushroom species that can be grown in Laramie? Pre 2.08- Post 3.92

How would you rate your general knowledge of growing mushrooms? Pre 2.33- Post 3.92

Rate your general knowledge of growing mushrooms in Laramie? Pre 2.2- Post 5.4

How would you rate your ability to identify wild mushrooms? Pre 1.5- Post 2.17

How would you rate your ability to identify edible mushrooms? Pre 1.83-2 Post.42

How would you rate your interest in growing mushrooms at home? Pre 3.83- Post 4.58

Have you ever tried growing mushrooms in the past? Yes=4 No=8

Do you think you would grow mushrooms at home? Yes=12 No=0

How would you rate what you learned in this workshop? 4.33

Should we organize one more refresher workshop soon? Yes=6

No=6

Was this workshop of value to you? Yes=12 No=0

Suggestions/comments for future outreach engagements?

Another workshop next year. More hands---on for participants.

## Other Outreach

Popular science paper featured in January 2015 Ag News

<http://www.uwyo.edu/barnbackyard/magazine/2015-archives.html>

Link to the announcement of October 2015 "How to Grow

Mushrooms" presentation in Wheatland- 28 people attended

<http://www.eventbrite.com/e/specialty-crop-workshop-2015-tickets-18965934621>



Summary of Microbiology Capstone Class Project designed to troubleshoot the production problems. ACRES presentation by Hailey Olsen and Jeff Hubbell


Join us for Special Guests **Lindsay Olson** and **Jeff Hubbell** from **Planet Laramie Mushrooms** On:




# The Art of Raising Mushrooms

**Wednesday, March 4th 7pm**

**Ag Building Rm 41**  
Stay after for the weekly ACRES Meeting!

Presented by...

 **ACRES Student Farm**  
*Laramie, Wyoming*  
uwstudentfarm@gmail.com



## SCREENING GRAPE CULTIVARS FOR ADAPABILITY TO EDAPHIC AND CLIMATIC FACTORS IN WYOMING

### PROJECT SUMMARY

The purpose of the project is to evaluate and identify promising grapevine cultivars for diverse edaphic and climatic zones of Wyoming, thus overcoming obstacles to initial vineyard establishment, resulting in increased production and early returns. The objectives are: 1) identify grapevine cultivars that exhibit rapid growth and establishment in specific soils and locations in WY and 2) study the influence of varying soil and climate on grapevine yield and quality. Grape production in Wyoming evinces strong interest from producers seeking viable alternatives to traditional crops and homeowners with backyard plantings. Intensive breeding efforts have led to development of excellent quality, cold-hardy grapevine cultivars suitable for production in colder regions including Wyoming. Diverse soils and variable climatic conditions throughout the state necessitate multi-location screening of promising grapevine germplasm to identify suitable region-specific cultivars. The project studied establishment, growth, yield and quality attributes of 10 grapevine cultivars at two locations. Identification of cultivars suitable for specific regions of Wyoming assisted growers and homeowners make the right choice of cultivar/s, improve production and enable a faster recovery of establishment costs. Active involvement of stakeholders ensured greater success for project execution and dissemination of information to growers throughout the state.

### PROJECT APPROACH

#### A. Site Selection and Vineyard Establishment

Sites were selected for establishing research vineyards at the Sheridan R & E Center and Powell R & E Center. Soil samples were collected from five random locations on the site and analyzed for pH, E.C. macro and micronutrients. A five feet tall high wire cordon trellis system was constructed using wooden posts (8 feet tall) at 20 feet distance within rows and two wires at 3 and 5 feet (12.5 gauge aluminum wire). End posts were securely anchored in the ground using 40 inch earth anchors. Wire tension on rows was adjusted using a wire vise tensioning tool. A drip irrigation system was installed at both locations to provide irrigations during periods of extreme drought (Figure 1; 2; 3).

#### B. Planting grapevines at test locations

Cultivars of *Vitis* interspecific hybrids were planted at a spacing of 10 feet X 5 feet at the Sheridan location (Table 1). The vines were planted in 30 cm deep holes that were filled with compost and supplemented with 50 g 19:6:12 Osmocote fertilizer. Grapevines maintained in the greenhouse were planted at the field site on June 14, 2013. Ten replicate vines for each

cultivar were planted. Ten cultivars of *Vitis* interspecific hybrids were planted at the same spacing at the Powell location.

### **C. Data Collection**

#### **i. Soil sampling:**

Soil samples collected from test locations were analyzed for pH, E.C. and essential nutrients. Soil pH was 7.5, which is considered to be good for cultivation of *V. riparia* based interspecific hybrids but low for *V. labrusca* based hybrids. E.C recorded was  $0.45 \text{ ds m}^{-1}$ , which was considered to be low in soluble salt content and suitable for grapevine production. Among macronutrients, N, P, K, Ca, Mg and S were considered to be sufficient for grape production. Among the micronutrients, Zn and Mn were considered to be low and supplemented when crop fertilization was carried out. Grapevines were fertilized with a slow release fertilizer 19:6:12 % N:P:K along with added micronutrients. Symptoms of iron deficiency were observed in the *V. labrusca* hybrids and was compensated by a foliar spray of micronutrients.

#### **ii. Growth parameters:**

Bud swell (%), and bud burst was recorded to estimate spring frost susceptibility and the percentage of live vines following the winter season (Figure 3; 4; Table 1 and Table 2). Pruning weights were recorded after bud break was observed to estimate for winter damage/ injury. Plant height was recorded on July 17, when the vines were most vigorous and at their fastest growing rate. When grapevines reached the top wire of the trellis system (5 feet), the plant height was recorded at being greater than 5 feet, the head of the vine was pinched and was trained horizontally to the top wire.

#### **iii. Flowering and fruiting parameters:**

Flowering and fruiting was discouraged in year 1 to allow for vine establishment. We planned on allowing grapevines to bear flower and fruit starting year 2. Excellent vine growth and development was observed until September 11, 2014 when the state (including test sites at Sheridan and Powell) experienced a snowstorm and received up to 8 inches of snow. The temperatures in the subsequent two days dipped to 18°F killing of all top growth. All top growth (that would cause flowering and fruiting in 2015) was killed during this snowstorm. This was evidenced by subsequent growth that occurred in 2015 where the above ground portions of vines were completely dead and growth occurred exclusively from the crown region of grapevines. Thus there was no flowering and fruiting observed in 2015 as vines had to be retrained from the ground level upwards. We plan to record flowering and fruiting parameters for 2017 and onwards.

## **GOALS AND OUTCOMES ACHIEVED**

The goal of the project was to identify specific grapevine cultivars for diverse soil and climatic conditions of Wyoming. We observed differences in survival rates between cultivars at the Sheridan and Powell location. While high survival rates (70% and higher) were observed in most



cultivars in Sheridan, the overall survival rate in Powell was 40%. Differences were also observed in dates of bud burst between cultivars at Sheridan and Powell locations. Preliminary data indicated that Frontenac, Marachal Foch and Osceola Muscat cultivars exhibited 100% survival in Sheridan, while 60% survival was observed in Frontenac Gris and Elvira cultivars. Further screening of cultivars over the years will help identify the appropriate cultivars that perform well under diverse soil and climatic conditions of Wyoming.

## **BENEFICIARIES AND MEASURABLE OUTCOMES**

Presentations were made on grape production at the following locations for updating grape growers and interested homeowners in research activities being carried out for expanding viticulture activities in Wyoming. Talks were presented at the “Living on a few acres” workshop in Cody (February 2013 – 60 people), Natrona county master gardeners conference (March 2013 – 30 people) and the Master gardeners conference in Sheridan (March 2014 – 50 people). A presentation was made to the Sheridan county master gardeners in April 2015 (15 people). A grape production workshop was conducted in Powell in May 2015 (30 people) to provide information on the use of the right training and pruning systems for cold-hardy grapevine cultivars. Presentations and visits were carried out at the annual field days in Sheridan (180 people over 3 years) and Powell for years 2013, 2014 and 2015 (160 people over 3 years). A number of prospective and current grape growers visited the vineyard and obtained information on suitable cultivars and vineyard establishment procedures during 2013, 2014 and 2015. Information to several growers and homeowners was also provided via phone consultations. Thus stakeholders statewide were benefitted from research activities. Beneficiaries of the project included current and prospective grape growers, homeowners and college students. Prospective growers (14) who requested information for growing grapes were provided information on site selection, soil and water analysis, varietal selection, sources for purchasing grapevines and grapevine management practices. Information was also provided to 9 current grape growers. Information on grape growing was also provided to 495 people at various presentations. Based on feedback obtained from prospective growers, we expect to see an increase of 8-10 acres in grape production in Wyoming.

## **LESSONS LEARNED**

Climatic conditions vary widely from year to year in Wyoming. A freeze in October 2013 prevented proper grapevine acclimation. This was followed by the polar vortex which caused a delay in bud break and vine establishment in 2014. An early freeze in September 2014 caused a significant delay in vineyard establishment as well. The key to successful grapevine establishment in various regions of Wyoming depends on the screening and identification of early season cultivars that will mature and ripen prior to the fall frosts/freezes. Limited

availability of cold hardy grape planting material can significantly delay vineyard planting. It is paramount to order planting material early, up to a year in advance to ensure vines can be obtained at the right time and planted at the beginning of the season to enable full utilization of the short growing season.

Figure 1. Steps involved in vineyard establishment



Vineyard establishment – Pounding posts



Vineyard establishment – trellis and drip system



Vineyard establishment – Lateral installation



Vineyard establishment – Drip tank (1500 gal)



Planting grapevine cultivars

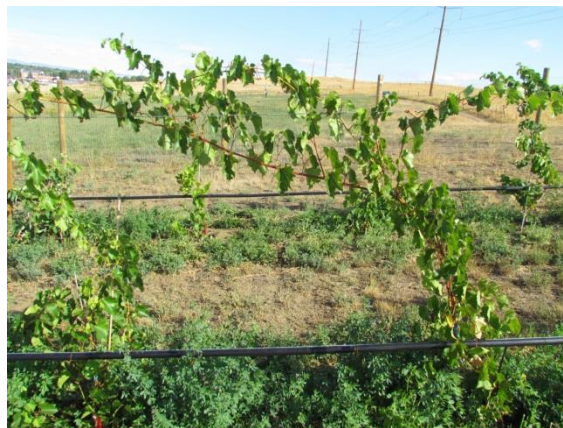


Plant establishment





Active growing grapevines



Active growing 'Frontenac' grapevine



Freezing injury to grapevines cultivars during the severe October 6' 2013 winter storm. Another snowstorm on September 11, 2014 caused similar damage to top portions of grapevines

**Figure 2. Growth and development of grapevines during the 2014 growing season.**



A. Test plot in Sheridan



B. Test plot in Powell





C. A Frontenac vine growth in Sheridan (July 10)



D. Frontenac vine growth in Powell (July 10)



E. Vineyard growth on September 10, 2014



F. Freeze-damage following the September 11 snowstorm

**Figure 3. Growth and development of grapevines during the 2015 growing season.**

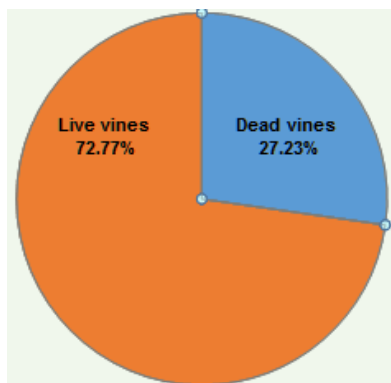


### A. Test plot in Sheridan

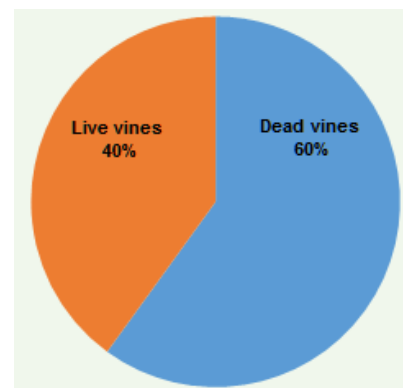


### B. Frontenac vine growth in July 2015.

Figure 4. Frost susceptibility based on grapevine survival rates (observed bud swell) at Sheridan and Powell locations (Year 2014)

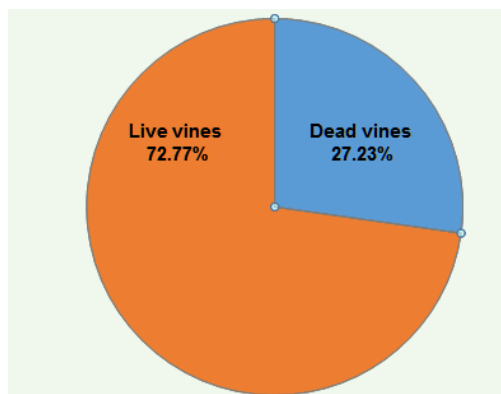


a. Sheridan

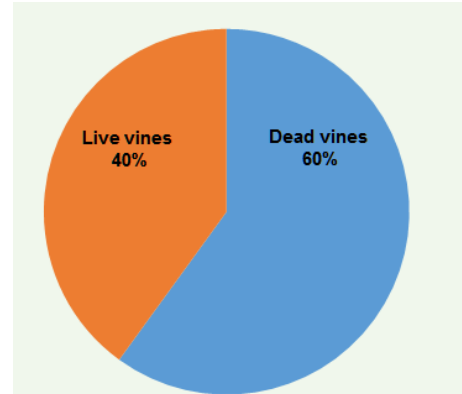


b. Powell

Figure 5. Frost susceptibility based on grapevine survival rates (observed bud swell) at Sheridan and Powell locations (Year 2015)



a. Sheridan



b. Powell

**Table 1. Winter survival, bud burst and plant growth rates of various grapevine cultivars (Year 2014 – average of ten vines)**

Cultivar	Survival % (Sheridan)	Survival % (Powell)	Bud burst (Sheridan)	Bud burst (Powell)	Plant height (Sheridan) (July 17)	Plant height (Powell) (July 17)	Pruning weights (g)
Osceola Muscat	100	50	May 21-24	June 7-10	> 5 feet	3.5 feet	210
Elvira	90	60	May 19-24	June 7-10	> 5 feet	> 5 feet	165
Frontenac	100	30	May 19-24	June 7-10	> 5 feet	> 5 feet	180
Marachal Foch	100	50	June 4-7	June 7-10	> 5 feet	> 5 feet	210
Canadice	40	20	June 4-7	June 7-10	> 5 feet	2 feet	140
Frontenac Gris	80	60	May 19-24	June 7-10	> 5 feet	> 5 feet	180
Fredonia	70	20	May 19-24	June 7-10	> 5 feet	4 feet	170
Brianna	70	40	June 14-19	June 17-20	> 5 feet	1.5 feet	160
LaCrescent	80	20	May 19-24	June 7-10	> 5 feet	1.0 foot	145
Marquette	90	40	May 19-24	June 7-10	> 5 feet	> 5 feet	170

**Table 2. Winter survival, bud burst and plant growth rates of various grapevine cultivars (Year 2015 – average of ten vines)**

Cultivar	Survival % (Sheridan)	Survival % (Powell)	Bud burst (Sheridan)	Bud burst (Powell)	Plant height (July 17)	Pruning weights (g)
Osceola Muscat	100	50	April 8-17	May 1-6	> 5 feet	170
Elvira	90	60	April 8-17	May 1-6	> 5 feet	150
Frontenac	100	30	April 8-17	April 30-May 5	> 5 feet	200
Marachal	100	50	April 8-17		> 5 feet	225

Foch						
Canadice	40	20	April 8-17	May 1-6	> 5 feet	165
Frontenac Gris	80	60	April 8-17	May 1-6	> 5 feet	210
Fredonia	70	20	April 8-17	May 1-6	> 5 feet	180
Brianna	70	40	April 8-17	May 1-6	> 5 feet	130
LaCrescent	80	20	April 8-17	May 1-6	> 5 feet	165
Marquette	90	40		May 19-24	> 5 feet	145



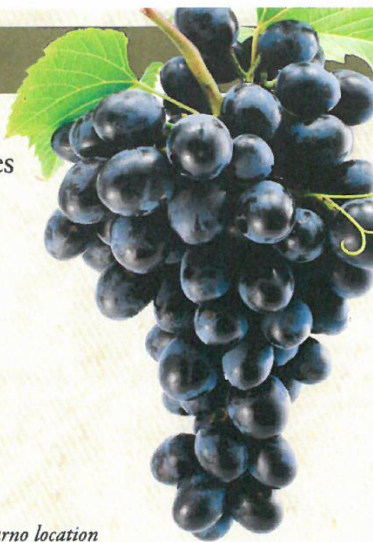
# JOIN US!

University of Wyoming  
College of Agriculture and Natural Resources  
Sheridan Research & Extension Center

## FIELD DAY

Saturday, June 14, 2014

8:30 am - 5:00 pm



### ACTIVITIES

#### INCLUDE:

- Tours at Wyarano and UW Watt Agriculture Center

### TOPICS

#### INCLUDE:

- Horticulture, forage production, and lawn and garden

### LOCATIONS:

#### Sheridan R&E Center at Wyarano

663 Wyarano Rd.  
(7 miles east from Sheridan Information Center on 5th St.)

#### Sheridan R&E Center at the UW Watt Agriculture Center

3401 Coffeen Ave.



### AGENDA

8:30 am

**REGISTRATION** at *Wyarano location*

9:00 – 10:30 am

**WELCOME, INTRODUCTIONS AND TOUR** of field trials at R&E Center near Wyarano.

10:30 – 11:00 am

**REGISTRATION** at *UW Watt Agriculture Center*

11:00 – 12:00 pm

**TOUR** field trials and vineyards located near Sheridan College

12:00 pm

**LUNCH** – *provided*  
(Please RSVP for lunch by June 9th)

12:45 – 1:00 pm

Sheridan College Ag Program and the partnership with UW – Ami Erickson

1:00 – 1:50 pm

**TOUR** labs

2:00 – 2:30 pm

Weed control in home lawns – Scott Hininger

2:30 – 3:00 pm

Native plants for the home landscape – Karen Panter

3:00 – 3:30 pm

The Wyoming Honey Project – Chian Jones-Ritten

3:30 – 3:45 pm

Break

3:45 – 4:15 pm

The Wyoming Grape Project – Sadanand Dhekney

4:15 – 4:45 pm

Berry production – Connie Fisk

4:45 – 5:00 pm

Wrap-up

For more information or to RSVP by June 9 –

Contact Rochelle at: (307) 673-2856 or [shrec@uwyo.edu](mailto:shrec@uwyo.edu)



UNIVERSITY OF WYOMING  
SHERIDAN RESEARCH  
& EXTENSION CENTER



# SHERIDAN RESEARCH & EXTENSION CENTER

University of Wyoming  
College of Agriculture and Natural Resources

## FIELD DAY

Tuesday, July 14, 2015 • 2:00 - 7:00 pm



### ACTIVITIES INCLUDE:

- Tours,  
presentations,  
dinner

### TOPICS INCLUDE:

- Pollinators,  
viticulture,  
horticulture,  
and forage  
production

### LOCATION:

Sheridan R&E  
Center at the UW  
Watt Agriculture  
Center  
3401 Coffeen Ave.  
Sheridan



### AGENDA

1:30 pm

#### REGISTRATION

2:00 – 4:00 pm

#### WELCOME, INTRODUCTIONS AND BEGIN TOURS

City Trolley available

#### Field Tour Schedule:

- **Sadanand Dhekney:** *Screening Grapevine Cultivars for Adaptability to Soil and Climatic Conditions in Wyoming Alleviating Grapevine Cold Damage in Wyoming Vineyards*
- **Sadanand Dhekney:** *Engineering Alfalfa Weevil Resistance in Commercial Alfalfa Cultivars: A Valuable Tool for Integrated Pest Management of Alfalfa Weevil*
- **Albert Adjesiwor:** *Productivity and Profitability of Irrigated Grass-legume Mixtures*
- **Blaine Horn:** *Forage Cultivars Suitable for Production under Sprinkler Irrigation*
- **Keith Klement and Jeremiah Vardiman:** *Status of the Wildlife Depredation Project*
- **Dan Smith:** *Bean Disease*

4:00 – 5:00 pm

- Refreshments (Social Hour) available outside near Greenhouse
- Self-guided Tour of the Research Greenhouse and Poster session (open to those who were not included in the field tour)
- Give away prizes

5:00 pm

- **Kentz Willis** presents on how food grown at ShREC was prepared for the meal
- **CattleWomen** introduction and thank you!
- Dinner Buffet starts

*Note: Dessert will be served to each table at 6:00pm*

5:30 – 7:00 pm

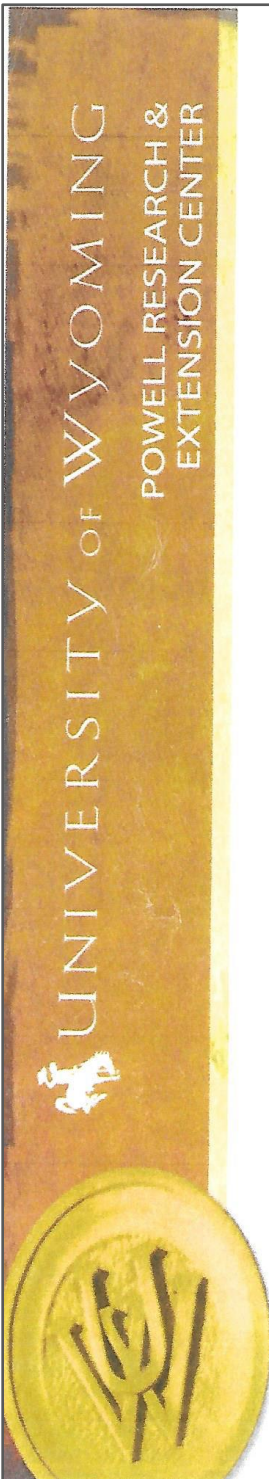
- **Roger Stockton:** *A Brief Overview of Some NRCS Programs Related to Pollinator Habitat*
- **Makenzie Benander:** *Multifunctional Flower Habitats*
- **Cliff Reed:** *A Producer's Perspective on Pollinators*

7:00 pm Conclude



Agricultural  
Experiment Station

For more information  
or to RSVP by July 10 –  
**Contact:** (307) 673-2856 or  
[shrec@uwyo.edu](mailto:shrec@uwyo.edu)



# FIELD DAY ACTIVITIES

3:00 **REGISTRATION** (table in front of Main office)

3:30 **OPENING REMARKS**

- **Frank Galey**, *Dean of College of Agriculture & Natural Resources*
- **Bret Hess**, *Associate Dean/Director of AES*
- **Kelly Spiering**, *Chairman of PREC Advisory Board*
- **Mike Moore**, *Interim Director of Operations, PREC*

3:30-7:00 **TOURING STATIONS** (See map on reverse side)

4:30-7:00 **DINNER** (@Foundation Seed Building)

Station No.	Presenter	Topic of Field Tour	Location
1	Kathy Parsons & Anne Leonard	Registration	Main Office Bldg.-Outside
2	Stan Skrabut	Ag-support computer applications	Main Office Bldg.-Classroom
3	Denny Hall	Seed Lab	Main Office Bldg.-Seed lab
4	Anowar Islam	Tall fescue for seed and forage production	Foundation Seed Bldg.
5	Bart Stevens	Phosphorous rates in sugar beets	Field 43
6	Roger Stockton	Cover crop and soil erosion demonstration	Field 10
7	Randy Weigel	AgriAbility gardening demonstration on therapeutic gardening	Foundation Seed Bldg.
8	Sandra Frost	High tunnels	Field 3
9	Milt Geiger	Renewable Energy demonstration trailer	Outside Shop
10	Mike Moore	PREC, WSCS, and Foundation seed	Foundation Seed Bldg.
11	Kim Decker	WY Department of Agriculture	Foundation Seed Bldg.
	Cindy Fulton	Pesticide compliance	Foundation Seed Bldg.
12	Robin Goose	Field peas for food and feed - two new varieties	Field 36
13	Sadanand Dhekney	Winterhardy grape rootstock	Field 3
14	Axel Garcia	Water use and water use efficiency of alfalfa	Field 1
		Water use and water use efficiency of corn	Field 4
		Effect of early termination of irrigation on yield and quality of confection sunflower	Field 5
15	Carl Coburn	Sainfoin herbicide study	Field 14



# Grape Workshop

This FREE event is open to the Public!!

## Topics Covered:

Vineyard Establishment

Assessing Cold Damage in Vineyards

Pruning Techniques

Tuesday May 5<sup>th</sup> — 1:00pm. to 3:00pm.

@

Powell Research and Extension Center

RSVP: Rachel Olsen  
rolsen7@uwyo.edu  
307-754-8836

THE UNIVERSITY OF WYOMING IS AN EQUAL OPPORTUNITY/AFFIRMATIVE ACTION INSTITUTION.



UNIVERSITY OF WYOMING  
EXTENSION



# Master Gardener Series

Thursdays ~ February 19th to April 9th ~ 6:00 to 8:30 p.m.

3401 Coffeen Ave. ~ Watt Ag. Center ~ Room 131

Fee \$75.00—Checks Made Payable to: *Sheridan County Master Gardeners*

**Class is limited to 30 participants**

Register by calling the UW Extension Office at 674-2980

or

e-mail [jlanka3@uwyo.edu](mailto:jlanka3@uwyo.edu) or [bgorzal1@uwyo.edu](mailto:bgorzal1@uwyo.edu)

<u>Class Date</u>	<u>Topic</u>	<u>Presenter</u>
February 19th	Lawns	Chris Hilgert ~ UW Extension Horticulture Specialist
February 26th	Gardening	Scott Hininger ~ UW Extension AG & Horticulture Educator
March 5th	Xeriscaping Landscaping	Donna Hoffman ~ UW Extension Horticulturist Natrona County
March 12th	Botany	Hanna Johnson ~ UW Extension Horticulturist Campbell County
March 19th	Entomology	Scott Schell ~ UW Extension Entomology Specialist
March 26th	Food Preservation	Kentz Willis ~ UW Extension Nutrition & Food Safety Educator
April 2nd	Grapes	Sadanand Dhekney ~ Assistant Professor Horticulture Sheridan Research Station
April 9th	Planting & Pruning	Scott Hininger ~ UW Extension AG & Horticulture Educator Sheridan



UNIVERSITY  
OF WYOMING  
EXTENSION





### Thursday, March 13, 2014

**9:00am - 5:00pm**

**MARKET MANAGER CERTIFICATION**  
(Put on by WDA)

Best Western Sheridan Center  
Ballroom

Lunch Included

**4:00pm - 5:00pm**

**REGISTRATION OPEN**

Best Western Sheridan Center  
Ballroom Lobby

**5:00pm - 9:00pm**

**WELCOME RECEPTION**

Best Western Sheridan Center  
Ballroom

### Friday, March 14, 2014

7:00am - 8:00am  
Registration - Whitney Center Atrium

8:00am - 9:30am  
Opening Remarks - Whitney Center  
Keynote: Adrian Card

9:30am - 10:45am  
SESSION ONE

Herbs Curtis Haderlie	Arranging Cat Flowers Donna Carr	Sustainable Ag. Soil Maintenance Renee King	Poultry/ Greenhouse Brad Holiday	Vertical Growing Nate Story
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10:45am - 11:00am  
BREAK

11:00am - 12:00pm  
SESSION TWO

Sustainable Ag - Business Adrian Card	Bees/ Pollinators Clifford Reed	Slow Food/ Eating In Andrew Nowak	Poultry/ Greenhouse Brad Holiday	Grapes/ Vineyards Sadanand Dhekney
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12:00pm - 1:45pm  
LUNCH

1:45pm - 2:45pm  
SESSION THREE

Herbs Curtis Haderlie	Arranging Cat Flowers Donna Carr	Slow Food/ Eating In Andrew Nowak	Vertical Growing Nate Story	Grapes/ Vineyards Sadanand Dhekney
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3:00pm - 5:30pm  
Hands On Workshops - Sheridan College  
Choose ONE Workshop

1. Fruit Tree Grafting (Steve Miller)
2. Food Preservation: In Home Use ONLY  
(Kentz Willis) Room 121 Watt Ag Center
3. Tomato Grafting (Tyler Mason)

Please note: You will need to sign up when registering as space is limited. The Grapes/Vineyards and Fruit Tree Pruning are also limited in space. Please sign up when registering.

6:30 - 9:00  
Dinner/Awards/Networking  
Best Western Sheridan Center - Ballroom

### Saturday, March 15, 2014

8:00am - 8:30am  
Good morning

8:45am - 9:45am  
Business Meetings - Whitney Center  
Master Gardeners

9:45am - 10:45am  
SESSION FOUR

Bees/ Pollinators Clifford Reed	Insects & Woody Ornamentals Lorenz King	Sustainable Ag. Soil Maintenance Renee King	Fruit Tree Pruning Chris Hilgert	Vertical Growing Nate Story
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10:45am - 11:00am  
BREAK

11:00am - 12:00pm  
SESSION FIVE

Slow Food/ Eating In Andrew Nowak	Composted Veggies/ Ornamentals Lorenz King	Sustainable Ag. Soil Maintenance Renee King	Fruit Tree Pruning Chris Hilgert	Poultry/ Greenhouse Brad Holiday
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12:00pm - 1:00pm  
Lunch and Closing

**50/50 Raffle:** Drawing at Dinner Friday night. Benefits go to WY BFBL program. \$5.00/ticket

**Seed Swap:** Friday & Saturday at the College, Friday Dinner/Awards at the Best Western Hotel. Bring your seeds to share and swap with other members.

**Silent Auction:** During Friday Dinner-proceeds to Master Gardeners. Be sure to bid on these great items donated by

**CANCELLATION POLICY**  
Cancellations received in writing prior to Feb. 24, will receive a full refund. A \$10 fee will be assessed for all cancellations after Feb. 24, 2014.  
**No Refunds for No Shows!**

### WYOMING MASTER GARDENERS & WYOMING FARMERS MARKETING ASSN. 2014 JOINT CONFERENCE

March 13-15, 2014      SHERIDAN, WY

**REGISTRATION**

NAME: \_\_\_\_\_

ORGANIZATION: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY, STATE, ZIP: \_\_\_\_\_

PHONE: \_\_\_\_\_

EMAIL: \_\_\_\_\_

**Fees valid for Early Registration ONLY!**

Thursday	
Manager Certification-Member	\$ 25
Manager Certification-Non-Member	\$ 50
Conference (FRI&SAT)	\$ 100
Friday Only	\$ 50
Saturday Only	\$ 50
WFMA Membership	\$ 20
WY BFBL Membership	\$ 30
Conference Special: Both Memberships	\$ 45

Registration received after February 24th or at the door

Manager Certification	\$ 50
Conference (FRI&SAT)	\$150
Friday Only	\$ 75
Saturday Only	\$ 75

Mail Registration and Payment to:

WFMA  
PO Box 20939  
Cheyenne, WY 82003

Register Online: <https://www.eventbrite.com/e/2014-wy-master-gardeners-and-wy-farmers-marketing-association-joint-conference-tickets-9683528695>

**Lunch will be provided. We will also be providing snacks, coffee, tea, and water stations.**

**A silent auction of garden-related items will be held throughout the day (ending at 2:30 pm). Proceeds will go to the Judy Logue memorial fund. Judy was a long-time master gardener in Natrona and a former president of State Master Gardeners.**

Agricultural Resource Learning Center (ARLC)  
2011 Fairgrounds Road, Casper, Wyoming  
This building is ADA compliant. If you have any questions about the facility, please call (307) 235-9400

Persons seeking admission, employment, or access to programs of the University of Wyoming shall be considered without regard to race, color, religion, sex, national origin, disability, age, political belief, veteran status, sexual orientation, and marital or familial status.

### 19<sup>th</sup> Annual Natrona County Master Gardeners Spring Conference

Saturday, March 29, 2014

**GROWING AND MAINTAINING  
TREES, SHRUBS AND FRUITS**

ARLC Building  
2011 Fairgrounds Road  
Casper, WY 82604  
307-235-9400

### Saturday, March 29<sup>th</sup>

7:45 - 8:15      Registration

8:15 - 12N      General Presentations

1:00 - 2:30      General Presentations

3:00 - 4:30      Breakout Sessions

**Presenters**

**Scott Skogerboe** - Scott has been the head propagator at Ft Collins Wholesale Nursery for the last 19 years. During those years he has grown over 3 million trees and shrubs. His father was from a pioneer family who came to Wyoming in 1877 in Crook Co. He has some fascinating stories about the Cheyenne experimental station and special fruit trees, including one of the original Johnny Applesseed trees.

**Steve Miller** - A University of Wyoming professor, Steve has been researching the historical and abandoned apple orchards of Wyoming. He is a member of the group that started the Wyoming Apple Project to find individual trees and heirloom varieties that have survived 60-70 years on their own.

**William Scott** - He is the owner of Green Tree Arboriculture and a senior partner in Arboriculture Education Associates. Bill will give two presentations. One is on recommended trees and shrubs for Wyoming and one on recommended fruit trees and other edibles for Wyoming.

**Jim Gerhart** - An arborist with the City of Casper Parks Department, Jim will discuss Storm Atlas and its effect on Casper's trees, Planting Trees, and Tree Maintenance.

**Sadanand A. Dhekney** - An Assistant Professor (Horticulture) at the University of Wyoming, Sheridan Research & Extension Center, Sadanand will discuss growing grapes in Wyoming. He has been developing cold-resistant grape varieties for 10 years.

**Jeff Edwards** - Jeff is the State Small Acre/Horticulture Specialist for the Univ of Wyoming Extension and the Pesticide Applicator Training Coordinator. He is an entomologist by training and is also a small scale small fruit producer.

**Bryan Anderson** - Bryan is with the Wyoming State Forestry Division responsible for the management of approximately 263,000 acres of forested trust land across the state. This management includes timber management and harvest, and managing our state lands for long term forest health and productivity. Bryan will be discussing proper ways to prune trees

## General Sessions

## 2014 Spring Conference Agenda

## Breakout Sessions

- 7:45 - 8:15 am Registration
- 8:15 - 8:30 am Announcements, Introductions
- 8:30 - 9:30 am The Cheyenne Experimental Station and Historic Fruit Trees - *Scott Skogerboe*
- 9:30 - 10:15 am Historic Wyoming Apple Trees - *Steve Miller*
- 10:30 - 11:30 am Recommended Trees, Shrubs & Fruits for Casper - *William Scott*
- 11:30 am Storm Atlas and Casper's trees - *Jim Gerhart*
- 12:00 N Lunch
- 1:00 pm Planting Tips for Trees & Shrubs - *Jim Gerhart*
- 1:30pm Tree Maintenance - *Jim Gerhart & Master Gardeners*
- 2:30 Break. End of Silent Auction
- 3:00 - 4:30 Breakout Sessions

Pick two of the three workshops:  
First session 3:00 - 3:45 pm  
Repeated from 3:45 - 4:30 pm



**Vineyards and  
Growing Grapes**  
*Sadanand A Dhekney*

**Growing Raspberries and Other  
Small Fruits**  
*Jeff Edwards*



**Pruning Trees**  
*Bryan Anderson*



### Registration Form Spring Gardening Conference March 29, 2014

Early Registration (prior to March 14) \$50  
Registration (received after March 14) \$70

Checks made payable to:

Natrona County Master Gardeners

Mailing address for registration and check:  
Natrona County Master Gardeners  
Spring Gardening Conference  
Att: Priscilla  
2011 Fairgrounds Road  
Casper, WY 82604

### YOUR INFORMATION

Name \_\_\_\_\_

Address \_\_\_\_\_

Phone \_\_\_\_\_

Email \_\_\_\_\_

## WYOMING CERTIFIED SEED POTATO MARKETING

### PROJECT SUMMARY

The purpose of the proposal was to increase the ability of Wyoming growers to market their seed potatoes both domestically and internationally. Southeastern Wyoming provides a significant freight advantage over many rival seed producers helping to enhance Wyoming ability to market seed potatoes domestically and internationally. Additionally Wyoming's field isolation provides excellent disease control while their proximity to nearly 40,000 acres of commercially grown table stock potatoes in Colorado Front Range, Texas, Kansas, and Nebraska areas provides an excellent marketing opportunity. Through PCAN certification the necessary documentation for exporting potatoes and the necessary certification of potatoes for marketing Wyoming seed potatoes domestically was provided.



### PROJECT APPROACH

The seed and export marketing strategies required numerous tests and certification provided by the Potato Certification Association of Nebraska. The contract between the Wyoming Department of Agriculture and the PCAN provided for the overall seed certification of Wyoming potatoes. Steve Marquardt of the PCAN oversaw all seed documentation, field inspections, and winter test trials performed. The Wyoming Department of Agriculture (WDA) followed up with nematode surveys. WDA currently has ten complete years of nematode history for land in production. Each seed lot was given a specific lot number by seed variety and geographic location. The lot then can be traced from plant date thru harvest and shipping. All activities regarding certification were completed in 2013-4. PCAN performed the 1<sup>st</sup> and 2<sup>nd</sup> visual inspections in Wyoming as planned in 2013. Leaf samples were collected on the 2<sup>nd</sup> inspection so that PVYN testing could be done in the PCAN lab in Berea, NE. The testing and documentation provided by PCAN were vital to marketing potatoes. Without this resource the Wyoming growers would be unable to obtain phyto-sanitary certificates for export or the proper seed documentation to market certified seed domestically.

May-Potatoes planted / acres submitted to PCAN by growers

June-1<sup>st</sup> visual field inspection by PCAN

July-2<sup>nd</sup> visual field inspection by PCAN / leaf samples pulled for PVYN testing

Aug-3<sup>rd</sup> and final visual field inspection by PCAN / lot is accepted or rejected

Oct-Bin Inspections by PCAN

Nov-April-Lot inspections performed by WDA for shipment



In 2013 crop year the number of acres of seed potatoes planted increased to 707. Of those acres only 580 were certified as 126 acres were withdrawn from certification due to hail damage. Potatoes were planted and submitted to PCAN as per the work plan. PCAN performed the 1<sup>st</sup> and 2<sup>nd</sup> visual inspections in Wyoming as planned. Leaf samples were collected on the 2<sup>nd</sup> inspection so that PVYN testing could be done in the PCAN lab in Berea, NE. Beginning March 1, and seed was inspected by WDA and shipped into Kansas.

## GOALS AND OUTCOMES ACHIEVED

**Goal** – Maintain and expand Wyoming certified seed potato industry through PCAN certification in order to provide the necessary documentation for exporting potatoes to Mexico and provide the necessary certification of potatoes for marketing Wyoming seed potatoes domestically.

**Benchmark** - Number of pounds of WY potatoes exported or sold domestically as certified seed potatoes in 2012 as recorded on phyto-sanitary certificates.

**Target** – We expect the # of pounds of WY seed potatoes exported or sold domestically as certified seed potatoes in 2013 to increase by 2%

**Performance Measure** – WDA and PCAN documented the seed planted, the summer visual tests, summer PVY leaf sampling, winter testing, and final seed certification of the quantity of Wyoming seed potatoes. All certified seed potatoes exports required a phyto-sanitary certificate that documents weight.

No potatoes from the 2013 or 2014 crops were exported to Mexico. Washington State, Oregon State, as well as Idaho, has flooded the market. Mexico was able to import from these states at a significantly lower price. Exports to the Canadian Market increased dramatically over the last two years. In 2012 no potatoes were exported. In 2013 865,000 lbs. were exported to Canada. In 2014 1,122,000 lbs. were exported. Potatoes were also sold domestically as either seed stock, table stock or seconds for processing. Inspection of potatoes and issuing of phyto's were handled by the Wyoming Department of

Agriculture Technical Service Division. The total number of acres has increased from 580 acres in 2013 to 801 acres in 2014 to 913 acres in 2015. The yield varied and was reported to have been between 350 -600 100wt per acre depending on variety and field location.

Average yield was approximately 450 wt. per acre. One grower indicated that 80% of their

potatoes go for seed stock. The increase in seed potato production between 2013 and 2014 was 38% and the increase between 2014 and 2015 was 14%. The difference between table stock and seed potatoes prices will vary year to year but on average there is approximately a \$10 per cwt spread.



## BENEFICIARIES

With the certification process, Wyoming certified potato growers have the ability to enter multiple markets that offer higher pricing. These include the domestic seed market or meet the criteria in order to ship internationally. Each year is unique. Export sales vary from grower to grower and what may be prevalent one year with a higher net return will the following year may be just the opposite. The certification program allows Wyoming producers to be versatile in the market place with the possibility of extended growth. The beneficiaries of this project include

Country Pride Potato, LLC, LaGrange, WY, Brown Enterprises, Pine Bluffs, WY, and Thompson Seed Potatoes as well as numerous employees of these entities. The potato growers also benefited from the project by their ability to value add their crop through certification. The economic benefit to the industry was \$168,000 in export sales and approximately \$2.88 million through certification.



## LESSONS LEARNED

Wyoming potato growers are continually looking for the best marketing opportunities. As the Mexico market was flooded with cheaper potatoes from Idaho the Canadian seed potato market opened up in addition to strong seed potato prices in the US domestic market. As with all plans crop damage is always a possibility. In 2013 a substantial hail storm struck 126 acres in the LaGrange area. Consequently, the percentage of #2's increased substantially for this grower. This meant they were not eligible for seed certification. These Wyoming potatoes were not a total loss as they are able to be shipped as process potatoes.

## CONTACT INFORMATION

Ted Craig  
Wyoming Department of Agriculture  
307-777-6651  
[ted.craig@wyo.gov](mailto:ted.craig@wyo.gov)